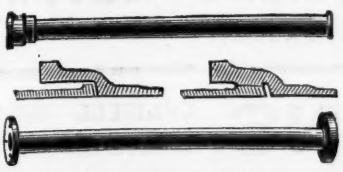
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXI. No. 1812.] LONDON, FEBRUARY 1, 1898. [50TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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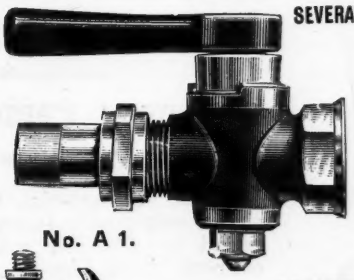


No. A 1.

THESE TAPS ARE

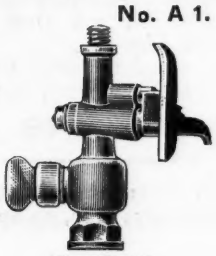
FULL-WAY

AS SHOWN.

SUPERIOR QUALITY AND FINISH IN GUN METAL.

No. A 1.

LANTERN TAPS.



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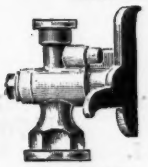

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No. A 12.

No. A 11.

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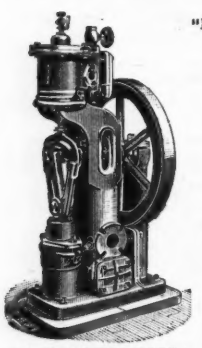

Fig. 705. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

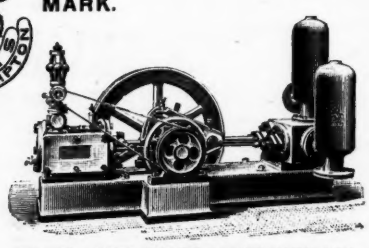

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

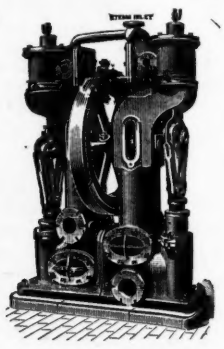

Fig. 712 "DOUBLE-RAM" STEAM-PUMP.

Pattern No. 42,314.

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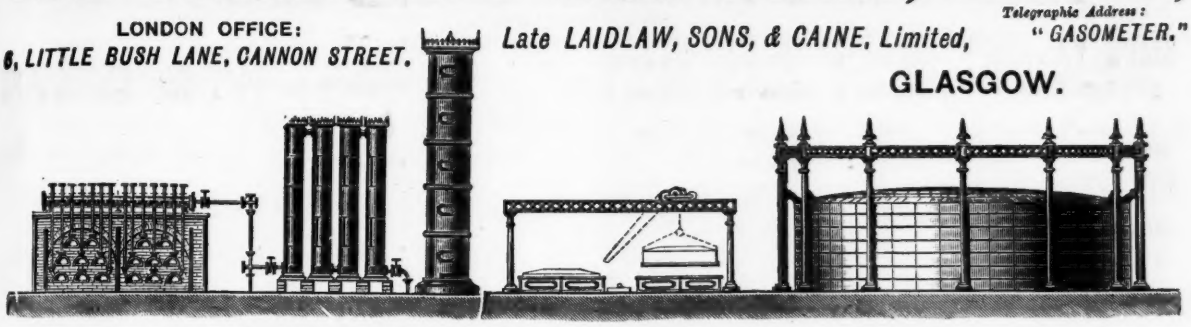

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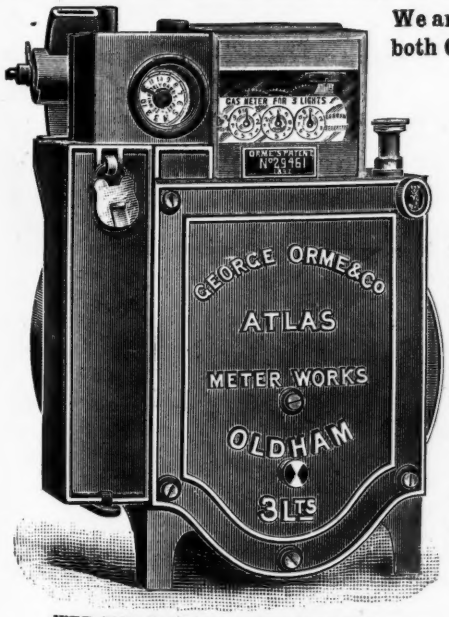

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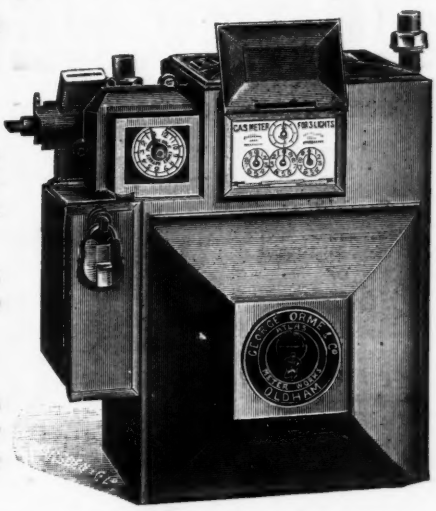

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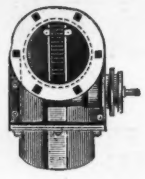

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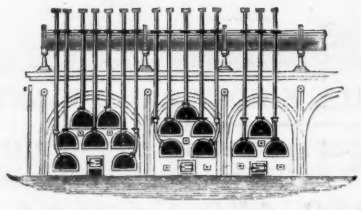

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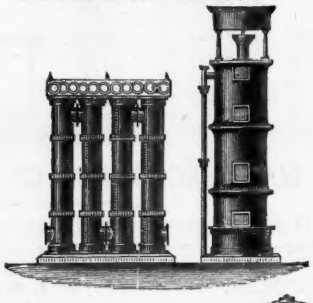

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Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,
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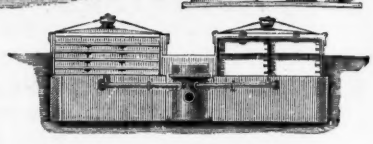

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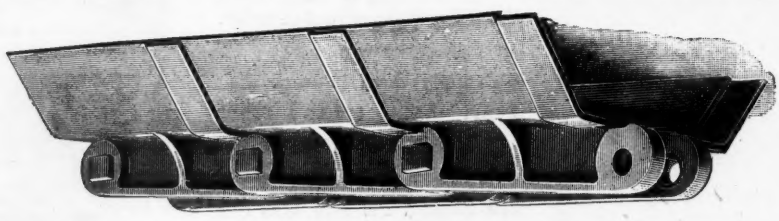

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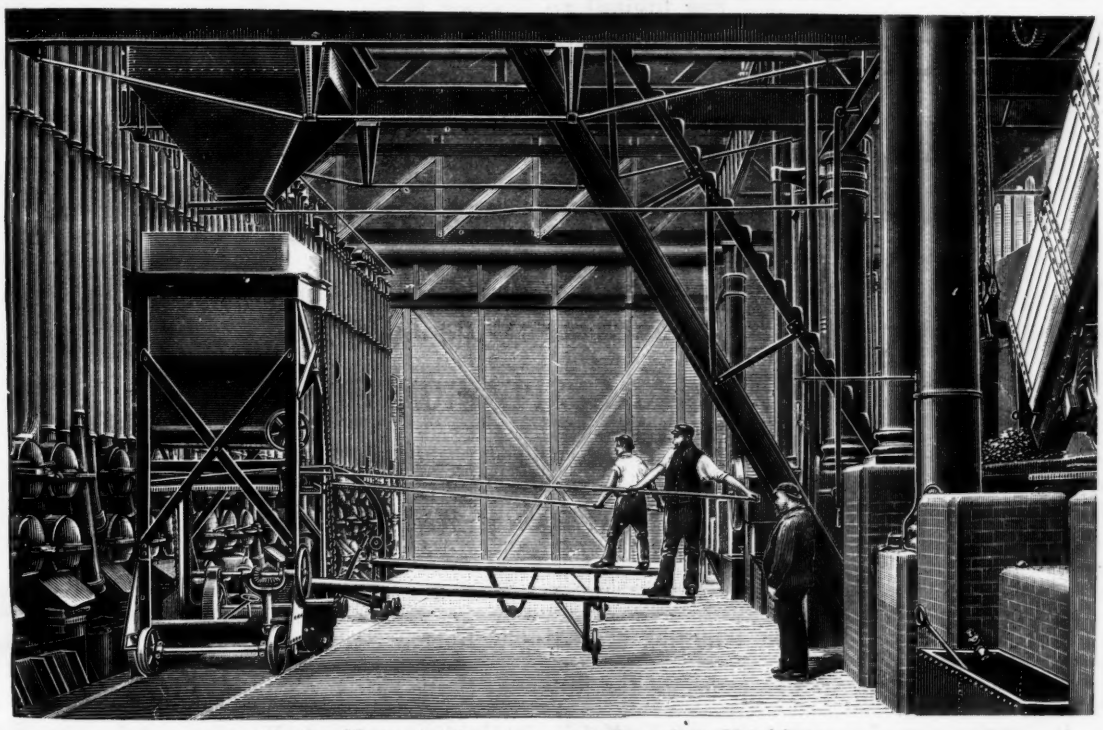

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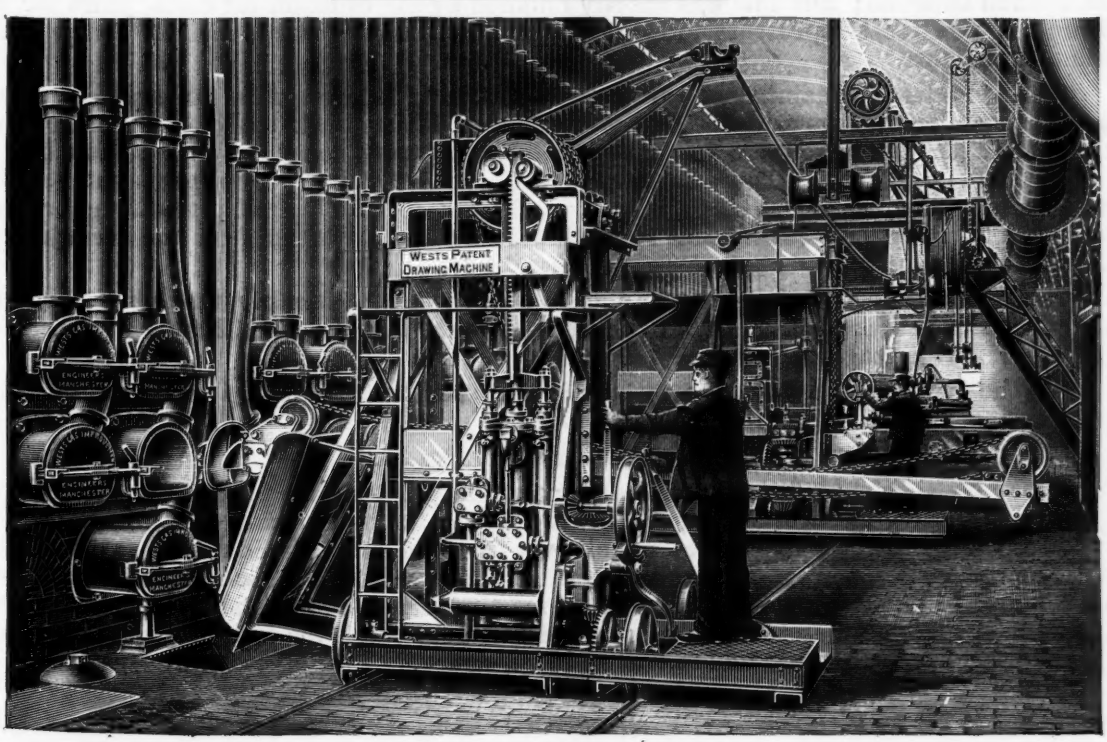

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IMPROVEMENTS IN STREET LIGHTING.

Highest Efficiency with Greatest Economy.

LIGHTING AUTHORITIES, GAS ENGINEERS, and GAS MANAGERS

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(Welsbach System),

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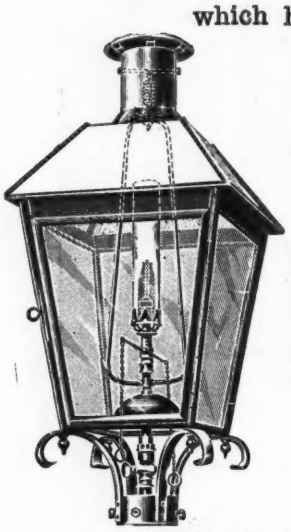

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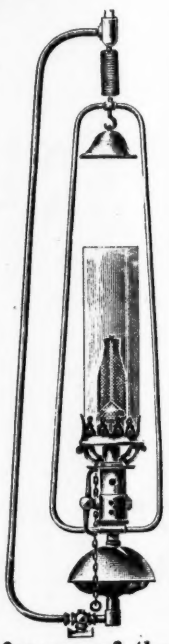

The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

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"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{5}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{3}{5}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

"The mantles have worked out to an average of three per lamp per annum; but, bearing in mind the absence of frost last winter, the writer believes that four mantles per light is more likely to represent average conditions."

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"The number of lights attended to per man averages 85."

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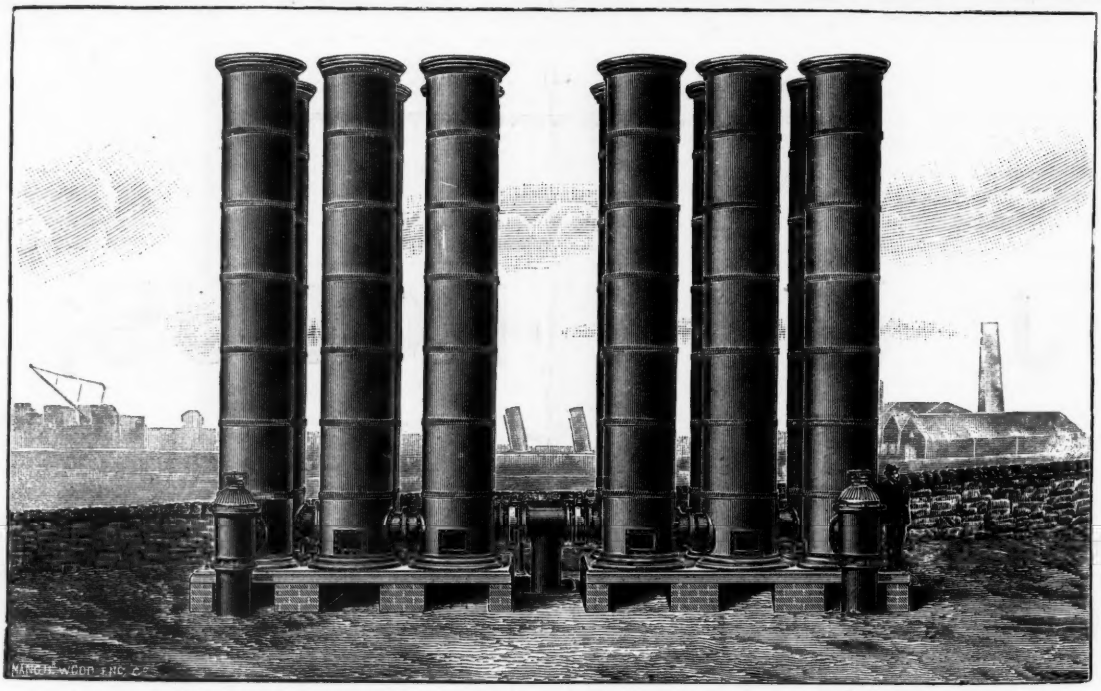

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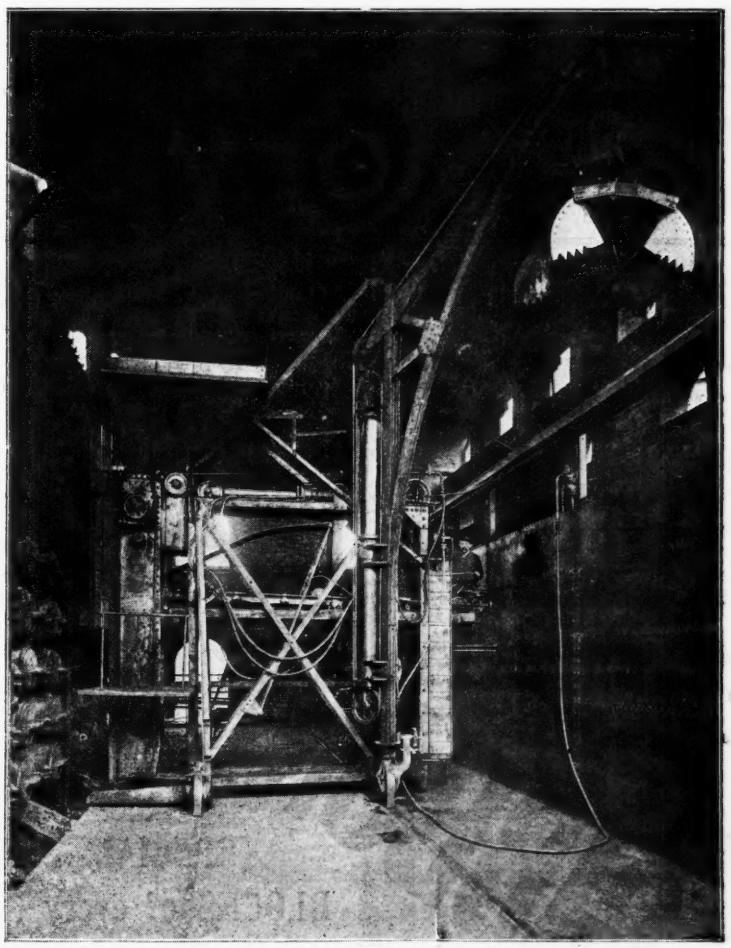

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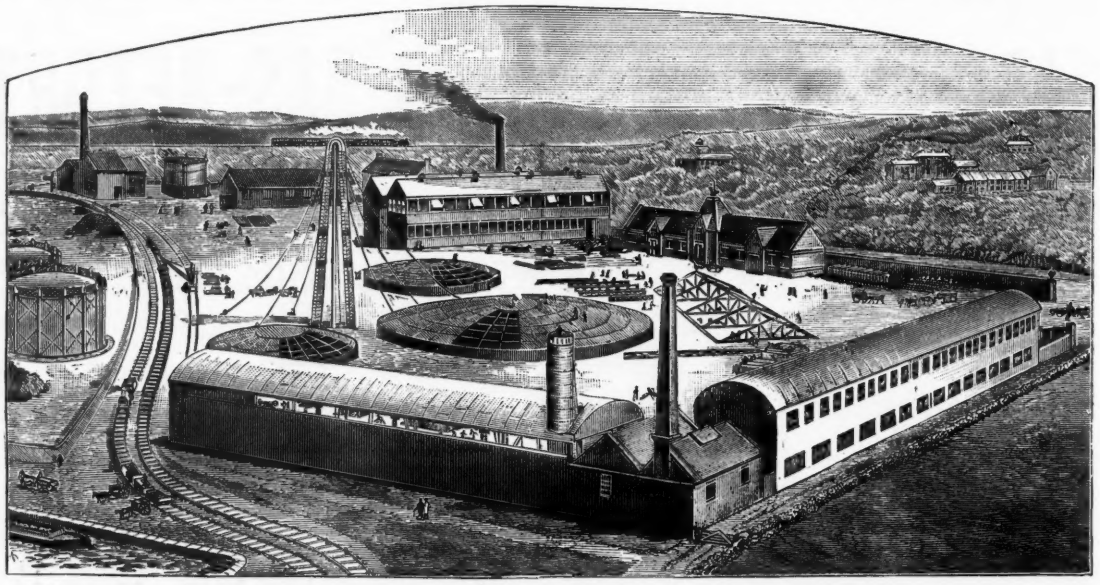

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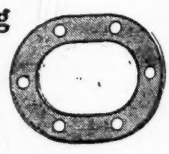

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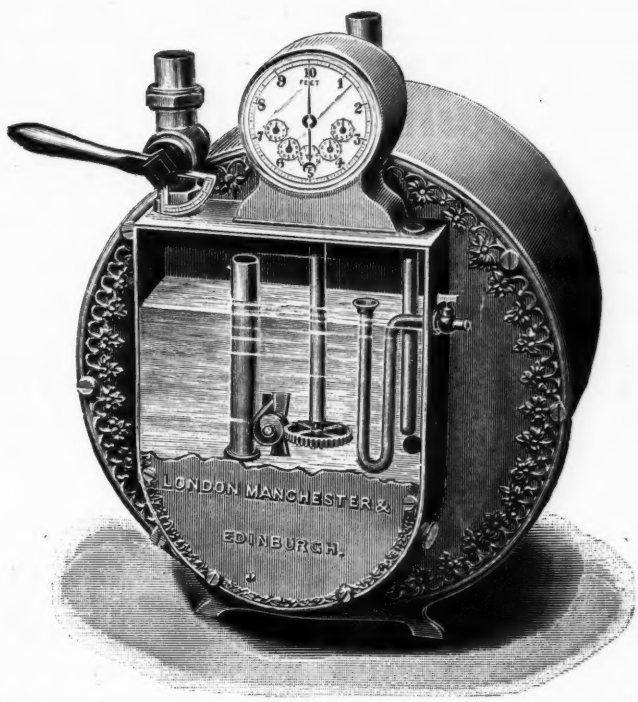

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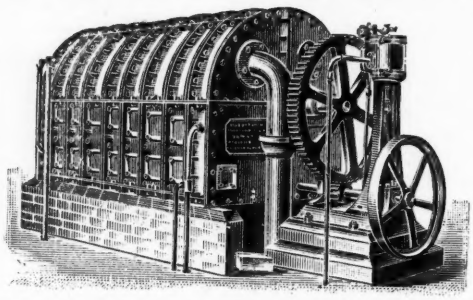

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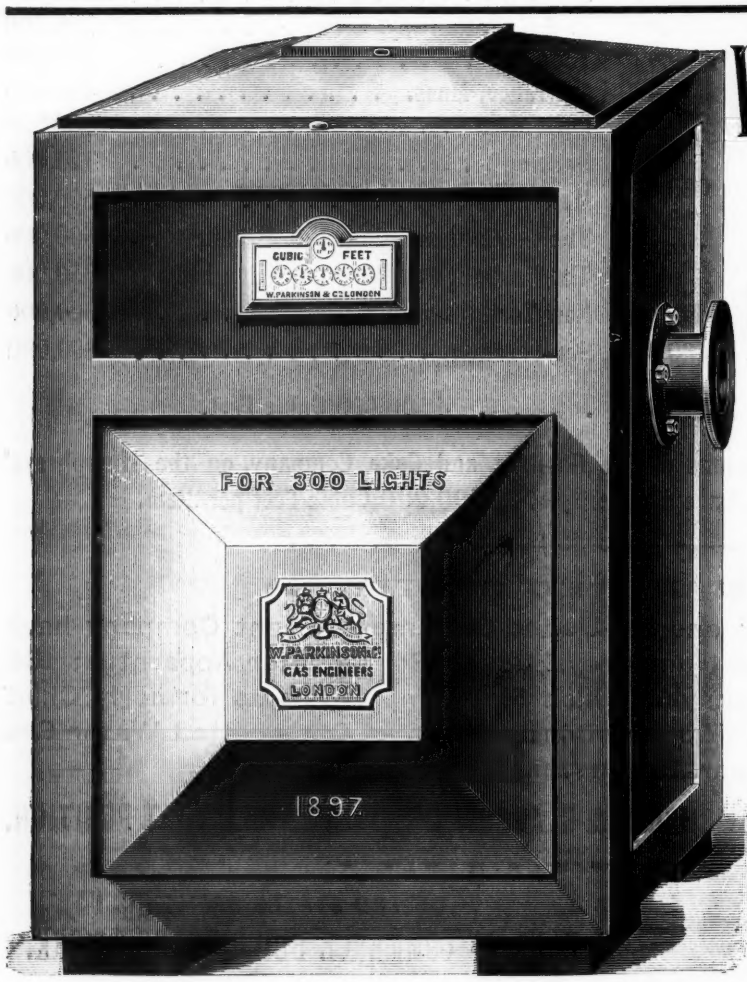

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

The Report and Accounts of The Gaslight and Coke Company.

THE report of the Directors and the statement of accounts relating to the past half-year's working of The Gaslight and Coke Company have been issued. We gave the report last week; and the principal portions of the accounts will be found in another part of the "JOURNAL" to-day. The ordinary general meeting of the proprietors will be held on Friday; and it will be followed by the "Wharncliffe" meeting for the consideration of the Company's Bill in Parliament. The chief interest of both the report and the accounts has been discounted by the announcement that the dividend which the Directors recommend to be declared, at the statutory rate of 12¾ per cent., has not been earned by £74,519; the reserve fund accordingly having to be depleted by this amount. This sufficiently deplorable confession stands in the forefront of the report. The second paragraph explains that the mildness of the winter has affected prejudicially the rate of increase in the sale of gas. Yet the increase for the whole year was after the rate of 4·51 per cent. It is next observed that the market for residuals continues to be depressed. The prices of coke and sulphate of ammonia remain very low; while "the receipts for tar products have been less than "they have been for many years past." The number of consumers steadily increases. The figures representing the new connections—14,613 of them being of the prepayment class—are cited as affording "further evidence of the "progress of the Company's business." The remainder of the report deals with the recent stock issues. The style of composition of this official communication is noticeably poorer than used to be the case in the Company's better days. There is a baldness about the whole report which gives one the impression that the draftsman had no heart for polishing his periods.

It is exceedingly difficult to write anything hopeful or helpful concerning these periodical Gaslight and Coke accounts. To declare dividends that have not been earned seems to have become the settled practice at the Horseferry Road. The Governor, Colonel Makins, has talked in the most light-hearted way about the astonishing manner in which the Company's available surpluses have in times past gone up and down in relationship to changes in the working conditions of the undertaking. Everything either is or is going to be for the best, according to the optimistic official view of the fortunes of the best-managed of all possible gas undertakings. It will be within the memory of "JOURNAL" readers that the Governor was quite angry with us six months ago for reminding those who were interested in the Company that they could not go on eating their cake and still have it. The finances of the undertaking looked bad enough then; but they are worse now, if appearances go for anything. The consumers of gas have paid up handsomely, as usual. They gave the Company £1,393,868 for the half year, instead of £1,364,325 for the corresponding period of 1896; which does not lend any countenance to the notion, so sedulously cultivated in some quarters, that London is learning to dispense with gas. What is gained by gas, however, is lost in other ways. Coke? Well, the bulk of the coke is gone. A stock of 154,725 tons has now melted away to 62,446 tons. The increasing manufacture of carburetted water gas must have had some influence upon these figures. Certainly, if the Company cannot sell their coke to advantage, the less they have to dispose of the better. Ammonia has improved; but tar has gone down to £49,296, which is worse than anything on record. On the other side of the revenue account, the growth of expenditure is again noteworthy. The production of carburetted water gas renders comparisons difficult; but it may at least be said that the march of technical improvement with this undertaking does not appear to lessen the manufacturing charges. There is little more to be remarked on the accounts, except to note that the entry for automatic meter supplies (fittings account) has increased to £281,445. The proprietors should know what this means, and how the Board propose to deal with this peculiar "asset."

The End of the Engineers' Strike.

AT last the great engineers' strike and lock-out is ended, in the complete victory of the employers over the Trade Unions and the utter discomfiture of the Socialist labour agitators. As we recorded last week, the head officials

of the Amalgamated Society of Engineers were compelled to confess that the campaign upon which they entered so light-heartedly in the summer had gone against them; and they could do no other than advise their followers to accept the terms of settlement offered by the masters. The advice has been followed by the majority of those who took the trouble to vote; and work is to be resumed as soon as possible. It is too early yet to define the actual results of the strike and its suppression. To say that it has added one more to the failures of the New Unionism and its exponents, in the persons of Tom Mann, John Burns, Barnes of the A.S.E., and other professional agitators, would be a very imperfect summary of the facts; yet this is an aspect of the matter that must not be overlooked. If the ordinary members of the A.S.E. and the allied Unions who were dragged into this demented revolt are rational beings, they will bethink themselves now of what Barnes and his fellow-agitators have to show for their performances of the last twelvemonth in the sacred name of Trade Unionism. We have heard a vast deal of the presumed value to the workmen of this country of the principles of Trade Unionism. Now is the time for those who are most immediately concerned to take stock of the operation of these principles, as realized in the practical constitution of the shattered and beggared A.S.E. As Barnes and his clique understand and apply it, Trade Unionism means that the British Workman is to put all his savings, his means of gaining a livelihood—all his worldly affairs and prospects, in short—irretrievably into the hands of his elected Society Executive. He is to strike when they order him to do so, for any cause they choose to allege; and he is to come to heel again like a spaniel at a word from them. That is Trade Unionism.

Have the discomfited strike leaders learnt wisdom by their defeat? Not at all. All they can see in the situation is a proof of the need for "a further combination of labour "federations." That is to say, the tyrants of a few Trade Unions would like to have command of the funds of the whole, so as to be able to do more mischief at their will. There is not the smallest chance of anything of the kind being brought about. The A.S.E. have in times past been the most arrogant and selfish of trade societies—seeking their own ends in utter disregard of the men of other trades. They paid for this in the hour of their distress. Although the federation of all Trade Unions is a dream of the disappointed agitator, the mere fact that this class of men should advance such a suggestion as growing out of the late strike, shows how blind they are to the realities of the situation. How are the industry and trade of the country to be preserved in future from the very serious mischief which such men have undoubtedly had it in their power, as well as in their will, to inflict? As we have already remarked, this is a question in the first place for the workman himself. Let him be ever so infatuated a Trade Unionist, on principle, he cannot, if he is outside the official ring, justify the system which has enabled Barnes and his mates to wreck in a year the whole fabric of a society that has been built up by patient efforts from a time before the present Secretary was born. It is immaterial for the moment what else Trade Unionism may be; but inasmuch as it has been a means for the erection of irresponsible despots with unlimited power for mischief, it stands condemned root and branch. If the tradesmen themselves will put their own house in order, well and good. A strong case exists, however, for parliamentary interference with these trade societies, in the interest of the ordinary members and of the community at large. The irresponsible despotism of Trade Union leaders is incompatible with the institutions of a free country. When the despot happens to be a Barnes, he mismanages his powers and comes to grief, together with the society that is so unfortunate as to get into his clutches. The evil is just as great, however, and much more difficult to cure, in the case where a really capable man, like Mr. Knight of the Boilermakers' Union, is the despot. Mr. Knight is not such a fool as to bet the existence of his Society upon the issue of a gratuitous strike, in which all the employers would combine to defeat him. He deals with individual shops, or groups of yards, and is always getting a little something more. A clever and an honest man is Mr. Knight; but he is nevertheless an exponent of a system which calls for reform in the public interest. He boasts, and with justice from his own point of view, of having fought the case of "Allen *v.* Flood" through the House of Lords at a cost to the Boilermakers' Union of £3000. Yet a Trade Union can neither sue nor be sued! And the Trade Union proceedings in this particular case, although not contrary to law, have been pronounced by all competent authorities inequitable as between man and man.

Well, the great strike is over. The masters are in a better position as regards the control of their works than they have enjoyed for many a long day; and the most restless trade society in the country has had a setting-down that will probably keep it quiet for many years to come. The fight was inevitable; and it has been fought to a finish. Taking it all round, the whole affair was one of the best things that could have happened for the British engineering trade. For years the men have not known who was master—the man who paid them their wages or he whom they paid themselves. Now they know. Moreover, the "Union stroke" has struck itself out; and the sapient policy of shirking has found its level. Those amiable philanthropists who have gone about bewailing the dreadful consequences that they expected would follow upon an unmistakable defeat of the men, can hardly understand how the late combatants can take matters so calmly, and shake hands over their expunged differences. It has been a good fight, and so well fought that it will not be necessary to fight it all over again in our time—as would have come to pass if the peace-making pleas of outsiders had prevailed for a season. Happily, trade is good; and work will be plentiful. Masters and men will be only too glad to let bygones be bygones, and set to with a will to make up for lost time.

The Board of Trade Returns of Gas Undertakings.

The Board of Trade returns relating to the statutory gas undertakings of the United Kingdom have at last appeared. The return relating to the undertakings of Local Authorities is made up to the close of the municipal year, March 25, 1897; while that which is concerned with "all authorized "gas undertakings in the United Kingdom other than "those of Local Authorities, only carries the statistics to "Dec. 31, 1896." There has been delay in the publication; but inasmuch as the parliamentary paper sees the light before the next session opens, it is fresh enough to be used in evidence before the Committees. Late or early, these statistical tables are by far the most trustworthy information of the kind that is anywhere to be obtained. Year by year the tables are more completely filled up, and tell a more convincing story of progress in gas supply. The grand totals are all that can be repeated here. These show that there are 641 authorized gas undertakings in the United Kingdom, of which 208 belong to Local Authorities, and 433 to statutory Gas Companies. These two classes of gas undertakings employ £76,180,724 of paid-up or borrowed capital; earning £19,659,571 on revenue account for the year, and spending £14,528,478. The weight of coal carbonized amounted to 12,296,739 tons, from which 127,041,603,000 cubic feet of gas were manufactured, and 116,883,313,000 cubic feet were sold. This volume of illuminating gas was distributed, through 24,457 miles of mains, to 2,845,728 consumers and 540,644 public lights. All these figures have increased year after year since 1882, when the returns were first compiled. It should be stated that the latest return exhibits the novelty of two additional columns—one for the nature and quantity of other materials (than coal) used for the manufacture of gas during 1896; and the other for the entry of the maximum proportion of carburetted water gas sold as an admixture with the coal gas. Some interesting facts appear in these columns.

High and Low Flash-Point Lamp Oil.

There is an ancient proverb which asserts that to give a dog a bad name is tantamount to hanging him outright; and the force of the saying is by no means exhausted. A curious illustration in point is supplied by the dead-set that is being made from certain quarters against the common petroleum lamp oil which is so largely used in England to furnish, not only the "poor man's light," but also to feed the lamps of those householders whose circumstances or taste prompt the use of this means of artificial lighting. We observe that the phrase "The Deadly Low-"Flash Oil" is coming into frequent use in newspaper reports of lamp accidents. There were several mishaps of the kind last week; and in one case, which occurred in Pimlico, an official of the London County Council undertook to lay upon the oil the blame for the deaths of two persons; while the Coroner "improved the occasion"

by remarking that "it was the duty of every person "who had occasion to use a lamp to use one that was "known to be safe, and it was equally his duty to use "oil of a proper flashing-point." It is not for us to dispute the proposition that lamps require careful usage. Whatever the character of the oil, petroleum lamps must of necessity be more dangerous in use than gas, which few respectable working-class householders need now go without. At the same time, it is both a mistake and a piece of injustice to blame oil or anything else for what is not its due. The question of the connection between the flash-point of burning oil and lamp accidents is by no means clear. It is idle for a Coroner to talk about the responsibility of lamp users for the flashing-point of the oil they burn. It would be as sensible to make the public responsible for the purity of the comestibles they purchase, or the composition and age of the liquors they consume. The price is the only expression of the quality of commodities that the consumer is able to deal with. The purchaser of lamp oil has the choice of at least two different grades of the article. The law does not discriminate between them with regard to safety; and why should the consumer trouble himself upon the point? Besides, how is he to know what flash-point he is paying for? Such are the wiles of the retailer, that the prudent purchaser, to whom money is "an object," usually pays the very lowest price for which he can get the article he needs. Then he has the satisfaction of knowing that he has not paid for his fancy, like the injured innocent who orders York hams and gets supplied with Canadian after all. "The public," said one of these philosophic shopkeepers on a recent occasion, "will buy anything by the name." That is the case; and these low flash-point agitators of the oil trade, if they had their way, would only upset a great industry without doing much more than play into the hands of the cheating retailer—so long, of course, as high-flash oil is worth more than low-flash oil. If there is going to be no difference, the objection disappears. But then, why is the high-flash oil so much dearer now?

Popular Mistakes and Alarms Concerning Gas.

To say that there is much in and about gas and gas-works that the general public cannot understand, is to utter one of the tritest of commonplaces. Yet now and again illustrations of the fact appear in the newspapers, which compel the amused attention of the better informed reader. Only the other day a *pseudo*-scientific periodical—one of those cheap pretenders to rank as sources of universal information for the people which cumber the modern bookstall—had a turn again at that much-abused appliance, the consumer's gas-meter. The sapient scribe had just discovered that although meters are tested for accuracy of measurement, the indices are not; and he forthwith assumed that the fraudulent gas manufacturers take advantage of the circumstance to put a wrong wheel in the train! This writer would obviously be a nice, reliable man to trust with the handling of "untold gold." Only yesterday we noticed a more innocent, but still a most pitiable blunder in the "Daily News" comment upon the burning of an oil factory adjoining the railway line at Newcastle-upon-Tyne on the previous Saturday. A deplorable incident of the fire was the bursting of a tank of oil, the contents of which ignited and were flung among the spectators, who appear to have approached imprudently near. A sensational incident of the conflagration was the dashing of the Scotch express through the flames. This is just the sort of story the newspaper reporter loves. There is some doubt as to the kind of oil that was contained in the exploded tank. One account describes it as resin oil, while another gives it as creosote. At any rate, there was no "low-flash" oil involved, or great would have been the outcry in some quarters. As it is, the "Daily News" opines that the occurrence reveals "one of the many "possibilities of danger which environ us in all great "cities." It goes on to observe: "These grim perils are "round about us in every great city, in spite of all pre-"cautions. The gasometers alone, if anything happened, "would play havoc with some of the most densely popu-"lated parts of London." It will be noticed that the writer is prudently vague in his reference to the nature of what might happen to convert gasholders into means of destruction; and it is only to be regretted that his prudence did not extend to the length of keeping him from writing about something which he did not understand.

WATER AND SANITARY AFFAIRS.

SPEAKING apologetically before the Royal Commission on the London Water Supply last week, Mr. Balfour Browne, Q.C., said the County Council, in producing evidence, had endeavoured not to go "behind" the report of the Balfour Commission, and if they had gone "beyond" it in any way, they were very sorry. Whether behind or beyond, it is evident the Council had committed something of a trespass; Lord Llandaff remarking that the Commissioners "had allowed Sir A. Binnie to go beyond" the report of Lord Balfour's Commission "in certain matters." There is something in a word. At the opening of the present Commission the Chairman announced that they would accept the report of 1893, and not go "behind" it. But they have lately allowed Sir A. Binnie to go "beyond" it; so far verifying our comment of last week, when we said: "The evidence now given by Sir A. Binnie, if it means "anything, supersedes the report of Lord Balfour's Com-"mission." The tendency still seems to go somewhat in that direction; and we find Sir Alexander piling up the figures to a kind of agony point. The Balfour Commission reckoned that 420 million gallons per day would provide for a population of 12 millions; the latter figure being at least three-quarters of a million in excess of the population likely to be found in the area of the Metropolitan Water Companies in 1931. Of course, the reckoning of the former Commission was based on an average, taking in the maximum and minimum demand. But Sir A. Binnie dwells on the maximum, which he reckons as exceeding 665 million gallons per day in 1931, while he puts the average annual daily supply at 554½ million gallons. The result is that he gets a daily supply of 49·55 gallons per head, whereas Lord Balfour's Commission reckoned on 35 gallons; and Sir A. Binnie himself thinks that 35 or perhaps 40 gallons per head daily would be sufficient for the Metropolis. If so, we may as well adhere to the Balfour reckoning, and rest content with 420 million gallons per day for 1931, especially as the population is likely to fall below the estimate for that date. Still Sir A. Binnie looks with longing desire to something greater; and he would not only prefer 40 gallons per head to 35, but cites figures to show how much water English-speaking people could and did make off with in other countries. In America there was the example of Buffalo, with a daily consumption of 325 gallons per head. We may presume that Deacon's waste-preventers are unknown in that city; and certainly the example is entirely thrown away upon London, which could never hope for a Buffalo supply, even if all the available waters in Wales were laid under tribute. In statistics such as these there is perhaps no need to be particular. As Sir George Bruce intimated, if we write down 60 gallons per head for London's daily supply in the heat of a 1931 summer, we might just as well say 120 gallons.

Sir A. Binnie, in reply to General Scott at the sitting of the Commission last week, stated that the supply of 420 million gallons per day estimated by Lord Balfour's Commission would be "exhausted" by about 1931. Of course, Sir Alexander did not mean that the supply would cease, but that it would prove insufficient. Then follows the further consideration which we stated last week: If 420 million gallons daily will not suffice, are we obliged to go to Wales in order to find more? On this essential part of the subject, some most valuable statements were made by Sir Edward Frankland not very long ago, in a lecture delivered at the Royal Institution. Basing his remarks on the figures furnished by Lord Balfour's Commission, Sir Edward showed that 537½ million gallons per day, of excellent water, were obtainable within the Thames basin. Such a volume, it was observed, would scarcely be required for the supply of the whole water area of London at the end of fifty years. Allowing that this was spoken in February, 1896, we get carried on to 1946; and as Sir A. Binnie told General Scott it would take fifteen years to bring a supply from Wales, the County Council scheme may safely slumber until the very end of the period anticipated by the Balfour Commission. On such a topic we may assuredly take the evidence of Sir E. Frankland as equal, if not superior, to anything the Engineer of the County Council can assert. Sir Edward has the advantage of a long experience on the London Water Question, having been one of

the Royal Commissioners who investigated the subject nearly thirty years ago, and who then reported on proposed new or improved sources of water supply to the Metropolis, including a scheme for bringing water from North Wales, and one for a supply from the Lakes of Cumberland. The conclusion then arrived at was thus expressed: "We are of opinion that both the schemes "are capable of furnishing the Metropolis with abundance "of excellent water. But they would be very costly, and "they are, in our opinion, unnecessary." This reads much like such a verdict as might now be given. It is rather singular that Sir A. Binnie is reported as making one calculation requiring only about 537¼ million gallons per day during the maximum period in 1931, which is almost exactly the quantity Sir E. Frankland has calculated as obtainable from the present sources.

With regard to administration and possession, Sir A. Binnie is, of course, all for the County Council. He brings forward as one special recommendation for the change, that if the command of the supply was thus concentrated there would be an end, "once and for all," to the continued inquiries which have been going on ever since the year 1811. We might suggest there is another and a better way of attaining this desirable result. If the authority at Spring Gardens will only curb its restless ambition, and rely more on equity and common sense, the extravagant contest for the acquisition of the water supply will speedily come to an end "once and for all." On the financial aspect we are presented with the argument that, had the water supply been in municipal hands in years gone by, there would have been a sinking fund, and part of the capital would now be paid off, as in the case of the main drainage works. But the ratepayers must have found the money for paying off the capital, whereas no such call has been made upon them; and the Companies have kept the debt upon their own shoulders. Sir A Binnie admits that if the County Council obtained possession of the water supply there would probably be "a slight "increase" in the charge to the consumer. But this he considers would only be temporary; and he thinks that ultimately there would be "a small reduction." This is not a very brilliant prospect for the water consumer; and if nothing more can be promised, there is little hope with regard to the performance. The verdict of the Commission started in 1868 still holds good—if distant waters are brought in, the undertaking cannot fail to be "very "costly," while at the same time it will be unnecessary.

Gas-Driven Plant for a Heavy Electric Railway.—A standard gauge electric railway is being built from the town of Trossingen, in Germany, to the railway station bearing that name—a distance of 2·8 miles, with no gradient exceeding 3 per cent. The power-house will be furnished with two Körting gas-engines, of 100-horse power each, to drive two 75-horse power dynamos.

Society of Engineers.—At the first ordinary meeting of the Society for the present year, which will take place at the Royal United Service Institution, Whitehall, next Monday, the outgoing President, Mr. G. Maxwell Lawford will present the premiums awarded for papers read during the past year, and his successor, Mr. W. Worby Beaumont, will deliver his Inaugural Address.

Soils and Subsoils about London.—A Parliamentary Paper has been issued dealing with the above subject. It forms one of the memoirs of the Geological Survey of England and Wales, and is written by Mr. Horace B. Woodward, F.R.S. It will be found of great use by all engaged in well-sinking, draining, and other occupations in which geological assistance is required; the author's personal observations, during his long connection with the Geological Survey, being supplemented by those obtained from medical officers, engineers, and architects, who have communicated their various experiences.

Earthen Dams for Reservoirs.—At the meeting of the Institution of Civil Engineers last Tuesday, a paper on "Reservoirs with High Earthen Dams in Western India," was read by Mr. W. L. Strange, Assoc.M.Inst.C.E. In the course of the paper, the author compared the different classes of dams, and showed that the ordinary earthen dam is the cheapest and quickest form of construction. He stated that for heights up to 60 feet it is quite safe. But its closure is difficult; and if this is not carried out in the way he described, it is likely to prove dangerous to stability. It does not require such expensive and solid foundations as masonry dams, and it has the great advantage that it can be raised from time to time to meet the demands for more water, or to restore the deficiency of storage produced by the silting up of the reservoir. He also described a "compound dam," which shared all the advantages of the ordinary earthen dam, but, in addition, could be safely raised to a considerably greater height, and its closure was safe and comparatively easy. It was, however, stated to be somewhat more expensive.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 241.)

THERE was more animation in some departments of the Stock Exchange last week. Dealings have broadened out, especially in American Rail shares, in which considerable activity prevailed at times. On the other hand, English Railway stocks have again suffered, through a batch of disappointing dividend announcements. Consols have also been dull on the harder tendency of the Money Market. The feature of the week has been the sudden demand for Welsbach Incandescent Light stock. On Monday, it was weak, at about par; but an inquiry set in on a report that several of the Gas Companies were recommending their customers to use the burner. This, coupled with a demand from Vienna, caused the stock to advance until it closed on Saturday at 120. With regard to Gas stocks, the tone has again been good, with a fair amount of business recorded. The greatest activity was in Gaslight "A," which, however, has fallen 1 on the week; but the "K" Preference has further improved by a rise of 2, and the 4½ per cent. debenture stock 1. South Metropolitan shows a firmer tone; being quoted 145 to 148. The Company are again giving their customers the opportunity of subscribing for stock at the price of £140 per cent. The Suburban and Provincial division remains inactive; and late values have been maintained. Imperial Continental has been inquired for; and the price has risen to 222. European were marked *ex div.* on Saturday, which accounts for the alteration in the quotations. Business in Water Companies is still much restricted; the only alteration being a fall of 1 in New River debenture stock.

The daily operations were: Gas on Monday was very quiet; but dealings were recorded in Gaslight "A" at 117½. Tuesday's business was much more active, especially in Imperial Continental, which marked up to 218¾. Gaslight "K" Preference rose 2, to 187–192. There was also a little more doing in Water stocks for the mid February settlement. On Thursday, Imperial Continental advanced 1, to 217–222; while Gaslight "A" declined 1, to 314–317. Friday was a quiet day; but the tendency was favourable—the business recorded being at previous quotations. There was very little doing on Saturday; but Gaslight "A" changed hands at 314½ and 315¾, and "H" preference at 206. Business was also done in Cape Gas 4½ per cent. at 12⅜, and Imperial Continental at 219½. In Water stocks, East London was dealt in at 236; and Southwark and Vauxhall Ordinary, at 165½.

ELECTRIC LIGHTING MEMORANDA.

Expiration of the Incandescent Lamp-Holder Patent—The Danger of Cheap Wiring—More Capital Wanted for Electrical Cabs—The Midland Electrical Power Scheme.

A NOTE of alarm has been sounded, not unreasonably, over the expiration last week of the important patent, granted in 1884 to Carl Dornfeld, for the incandescent electric lamp-holder which has been most generally used in this country. This was the well-known spring socket and bayonet joint pattern holder manufactured by the Edison and Swan Company, who found it took better with the public than the Edison screw holder, the patent for which expired in 1894. Since this period, the trade has been greatly troubled with cheap and nasty screw holders, while good ones have been difficult to procure. It is feared that a similar fate will now befall the spring and bayonet joint lamp-holder; though there is the same way of avoiding the worst trouble that remained to buyers of lamps when the Ediswan master patent expired. This is the simple expedient of continuing to deal at the old shop. In the case of their holder, the Edison and Swan Company not only manufactured for themselves, but licensed seventeen other firms upon terms which ensured a fair price for the article. It is stated that even now the Company and their principal licensees have agreed upon a fair minimum price, which, if it can be maintained, will save the manufacture from being ruined by cut-throat competition. It is to be hoped that the arrangement will hold good.

The danger is, however, lest contractors for electric light wiring should get into the way of using the cheap and bad lamp-holders with which they will be tempted. The issue is not so much in the hands of the public as it was in regard to the lamps. When the lamp trade was thrown open, and all kinds of cheap rubbish was put upon the market, very little real harm was done. There was no question of risk involved in the use of lamps; and if the bad ones broke down and gave a poor light, the users soon discovered their mistake in buying them, and went back to a reliable make. What are intended to be permanent fittings, however, occupy a different position. Mr. Walter Blenkarn wrote the other day to the "Electrical Review" stating that the fire insurance companies would need to look out when the lamp-holder patent had expired. "Let them start on lamp-holders," he says; "they will have a busy time shortly." From this it would appear that the progress of electric lighting, of which we hear so much, is not in the direction of greater safety.

A somewhat impudent attempt was made last week to procure

a large addition of capital for the London Electrical Cab Company. We are, of course, in ignorance as to the result of the proposed issue. The reason we venture to stigmatize it in the above terms is the exceeding thinness of the promise of profitable employment of the money which was put forward by the Company. This was in the form of a report by Messrs. Kincaid, Waller, and Manville, who confined themselves to saying that, having examined the Directors' statement of how it was proposed to spend the new capital, they considered that "a satisfactory profit will be made." Feeling possibly that this was hardly strong enough, the Engineers went on to observe that, upon further inspection of certain "estimates," they expected that "a still larger rate of dividend will be earned." This sweeping and precise endorsement is described by one of our electrical contemporaries as a "satisfactory report." Some people are easily satisfied. If we were asked to characterize the report, it would not come out in this way. If Messrs. Kincaid, Waller, and Manville know how much it costs to place an electrical cab upon the streets of London, and run it, why do they not publish the information? The world could then judge whether there is ever likely to be any money in the business.

The power scheme of the Midland Electrical Corporation was discussed recently at a meeting in Birmingham which was attended by a number of leading manufacturers and others interested in the South Staffordshire coal and iron trade. Mr. J. F. Albright, on behalf of the Company, explained the objects of the undertaking for which statutory powers are being sought. The idea is to generate electricity for power purposes at a suitable centre, and distribute it over the whole region by means of six or eight circuits, from which supplies could be obtained at prices varying from 1d. to 3d. per unit. Sir Alfred Hickman remarked upon the vagueness of this estimate; observing that, if the supply was to cost 3d. per unit or thereabouts, the different local authorities of the district who have electricity supply undertakings of their own would hardly care to admit it as a competitor. On the other hand, if the Company could distribute electrical power for anything like 1d. per unit, all those authorities, as well as other interests, would gladly welcome it. The future of South Staffordshire as a mining and iron-working centre is doubtful, in the estimation of Sir A. Hickman and his colleagues of the Iron and Coal Masters' Association. The question of mine drainage is a troublesome one, which will grow more instead of less difficult with time; and seeing the useful part that electrical power, at a price, is calculated to play in pumping and hauling, to say nothing of other applications, Sir A. Hickman thinks any local authority who should oppose a scheme of this kind would incur a grave responsibility. Mr. Albright, in reply, repeated that, broadly speaking, it was the desire and intention of the Company to furnish electrical power at the price of 1d. per unit; but this rate would depend upon the number of hours for which the supply was needed. Electrical power at this low figure would have a future to which it would be hazardous to set bounds.

THE SULPHATE OF AMMONIA COMMITTEE AT WORK.

Six months have elapsed since the formation of the Sulphate of Ammonia Makers' Committee; and many people who are concerned in its objects have of late been curious as to the protracted silence of the Executive. Though silent, the gentlemen composing that Executive have not, we are in a position to say, been by any means inactive. The task they took in hand has been a more formidable one than the mere looker-on can form any conception of; and fully recognizing the responsibility which rested upon them, they determined that the work should be well done, and that no effort should be wanting on their part to secure the end for which they were appointed—the eventual raising of the status of sulphate of ammonia in this country. In planning their course of action, frequent meetings have been held, long railway journeys undertaken, and they have sought and received the advice of some of the leading agriculturists—all of which, it need hardly be said, has involved considerable correspondence. Some of the subscribers seem to be of opinion that the preliminary work would have made more rapid progress if the Executive had appointed a salaried official to take the reins in hand. But many considerations weighed with them in choosing the course which they have pursued. At the beginning of a new scheme of this kind, where so many interests are embraced, and on the soundness of the foundation of which so much depends, they could hardly be expected to say who of those who might have offered themselves for the position would have been the most suitable and worthy of their trust. They preferred—at all events at the outset—to lay down their line of operations by taking counsel together, rather than be guided by an individual mind; and we think the action which they have so far taken will prove the wisdom of this course. Besides, the Executive desired to obtain for those who had entrusted them with the direction of the work of the organization, the greatest possible results from the expenditure of their subscriptions; and therefore, by taking the whole of the preliminary work on their own shoulders, they have effected a saving of money which may be usefully employed in prosecuting their aims.

By the courtesy of the Chairman of the Executive (Mr. W. G. Blagden), we are able to lay before our readers an account of the steps which have so far been taken by them. With the view of encouraging the use and application of sulphate of ammonia, they have, within the past few days, issued circulars to about seventy Agricultural Societies, offering prizes, either in money or in cups, for the best-grown crops in five classes: (1) For the best 3 acres of yellow turnips: (2) for the best three acres of swedes; (3) for the best 2 acres of mangolds; (4) for the best acre of early potatoes; and (5) for the best 3 acres of late potatoes. The value of the prize in each class is fixed at £10; and as each Society to which a circular has been sent may select any one of the classes, the Committee are committed to an expenditure of something like £700 in this direction. The conditions attaching to the offer of these prizes are interesting. There must be at least three competitors in each class, or the prizes will be withheld. In each class, every competitor must use sulphate of ammonia, together with farmyard manure or artificial manures, consisting of any combination of phosphatic manures (dissolved or undissolved), sulphate or muriate of potash, kainit, common salt, also lime or lime compost. Of course, no other nitrogenous manure than sulphate of ammonia may be used. The judges (who are to be appointed by the Societies who take up the competition) are in every case to weigh an average plot of not less than 2 perches; and in awarding the prizes, they are, in each class, to take into consideration both the quality and keeping properties, as well as the actual weight, of the crop.

The Committee next propose to disseminate among farmers and other users of nitrogenous manures two pamphlets from the pens of gentlemen who have a practical acquaintance with the employment of sulphate of ammonia for fertilizing—Mr. John Hunter, F.I.C., F.C.S., of Edinburgh, and Mr. Middleton, a Yorkshire farmer. These pamphlets are now in the press; and the Executive are having 100,000 copies of each printed. They have also decided to keep the merits of sulphate of ammonia constantly in evidence by means of advertisements in the agricultural papers—indeed, a small commencement has already been made in this way in the "North British Agriculturist," from which paper we have taken an account of some interesting experiments which have been conducted on Lord Rosebery's estate at Dalmeny with various systems of manuring, and the results of which experiments, it will be gathered, are highly favourable to sulphate of ammonia (see p. 229). The Executive have also decided to offer a substantial prize—viz., £500—for an essay on sulphate of ammonia; and at their next meeting, they will discuss the conditions on which they will invite competitions. Rumours as to this prize have been in circulation for some time past; but we learn that the matter has been held in abeyance, in order that the Executive might devote attention solely to the best means of distributing information regarding sulphate of ammonia before the commencement of the farming season this year.

So far the Executive appear to have done their work thoroughly well. They have set before themselves a big task; and we heartily wish them success. At the present time, far the larger proportion of the total quantity of sulphate of ammonia made is produced in this country; and yet, notwithstanding the immense amount of high farming carried on here, only about one-fourth of the output is used at home—the remaining three-fourths being sent abroad for sale. The aim of the Committee is to try and reverse this condition of things; but the firm footing which the Nitrate of Soda Committee have obtained in this country, makes the task an extremely difficult one. However, it is the opinion of a gentleman who occupies a prominent position in the gas products market that the formation of the Committee has already had a very beneficial effect. Writing with reference to the advance which has lately taken place in the price of sulphate of ammonia, he says: "I unhesitatingly state that this is entirely due to the action of the Sulphate of Ammonia Committee, and in a very simple way. The large makers having come together have discovered that there are no stocks of importance anywhere, and particularly that the gas companies were not carrying a heavy stock, as was reported."

THE GAS UNDERTAKINGS RETURNS.

The returns relating to the gas undertakings of the United Kingdom for the year ending Dec. 31, 1896, in the case of the Companies, and March 25, 1897, for the Local Authorities, were issued last Wednesday, pursuant to an order of the House of Commons dated the 29th of July. These returns are somewhat belated as compared with those for 1895-6, which were ordered on Aug. 11, 1896, and appeared on Dec. 21. However, they present additional information which will possibly afford some compensation to those of our readers—and the number is by no means small—who have addressed inquiries to us as to the delay in the publication of these important papers. We shall not attempt any analysis of the mass of statistics contained in the returns, but simply indicate the nature of the changes made, and give the principal totals.

The returns furnish particulars in reference to 433 authorized gas undertakings in the hands of Companies—being four more than in the preceding returns. Three of the Companies are in Scotland, and nine in Ireland. This year returns are furnished

in regard to the gas undertakings at Cowes and Fort William; but they will soon disappear—the former having been acquired by the Local Authority, and the works connected with the latter being no longer in use. The other new comers are Chester-le-Street, Laindon, and Settle; but Chesterfield has dropped out. The Local Authorities' returns refer to 208 gas undertakings, as compared with 203 for the year 1895-6. Among the fresh places now furnishing particulars are Dunfermline and Matlock Bath; and, of course, Chesterfield appears in the returns. Of the total, 38 are in Scotland, and 7 in Ireland. The amount of capital authorized by the 641 gas undertakings is £89,995,391, of which £76,180,724 has been paid up and borrowed. The previous amounts were £84,410,867 and £70,819,742. The receipts on revenue account are £19,659,571, as compared with £19,461,147; and the expenditure is £14,528,478, against £14,373,288. The amount of capital authorized for gas undertakings in the hands of both Companies and Local Authorities includes, in some cases, other purposes. Turning to the statistics of working, the quantity of coal and cannel carbonized in the period covered by the returns was 12,296,739 tons; the bulk of gas produced being 127,041,603,412 cubic feet, of which 116,883,313,734 cubic feet were sold. The previous totals were: Coals, 11,937,446 tons; gas made, 121,421,752,691 cubic feet; gas sold, 111,443,701,941 cubic feet. At the dates to which the last returns were made up, there were 24,457 miles of mains in use for the supply of 2,845,728 consumers and 540,644 public lamps. The previous figures were: Miles of mains, 23,857; gas consumers, 2,659,771; public lamps, 526,888. As a rule, the returns are made up to the above-named dates; but where other periods have been taken the fact is indicated.

As in previous returns, precise information cannot in some cases be given as to the make of gas, the consumption for public lighting, and the length of mains. As a general rule, however, the particulars required by Parliament are furnished. The Board of Trade are not unmindful of the fact that changes have taken place in the methods employed in the production of gas since these returns were first ordered by Parliament. In those under notice, space has been found, by the abolition of the "Remarks" column, and giving the observations as foot-notes, for two additional columns—one for particulars as to the nature and quantity of other materials than coal used for the manufacture of gas; and the other for answers to the questions whether carburetted water gas is supplied, and the maximum proportion of its admixture with coal gas. The extent to which oil, petroleum spirit, or "other material," is now utilized for gas making will be seen from the following list of Companies and Local Authorities who make returns in regard thereto:—

Companies.

Barking.
Bath.
Bournemouth.
Brighton.
Bristol.
Bromley.
Canterbury.
Commercial.
Croydon.
Crystal Palace.
Dover.
Dublin.
Eastbourne.
Folkestone.
Gravesend.
Gaslight and Coke.
Godalming.
Guildford.
Hampton Court.
Hastings.
Hoddesdon.
Hornsey.
Hoylake.
Huyton and Roby.
Hythe and Sandgate.
Isle of Thanet.
Liverpool.
Longwood.
Maidstone.
Mitcham.
Musselburgh.
Portsea Island.
Preston.
Richmond.
Rochester.
Slough.
Snodland.
Southend.
South Metropolitan.
Staines.
Swansea.
Tottenham.
Tunbridge Wells.
Waltham Abbey.
Watford.
West Ham.
Winchester.
Windsor.
Yarmouth.

Local Authorities.

Alloa.
Alva.
Ardrossan.
Belfast.
Birkenhead.
Birmingham.
Blackburn.
Broughty Ferry.
Chorley.
Colne.
Coventry.
Dumfries.
Falkirk.
Glasgow.
Greenock.
Hereford.
Huddersfield.
Manchester.
Middlesbrough.
Perth.
Rochdale.
St. Helens.
Salford.
Smethwick.
Southport.
Stockport.

With regard to carburetted water gas, the returns show that when they were made up it was supplied by the following Companies and Local Authorities:—

Companies.

Bath.
Brighton.
Gaslight and Coke.
Hastings.
Hornsey.
Hoylake.
Liverpool.
Preston.
Southend.
Swansea.
Tottenham.
Winchester.

Local Authorities.

Belfast.
Birkenhead.
Birmingham.
Blackburn.
Coventry.
Southport.
Stockport.

The proportion in which water gas is supplied is generally 25 or 30 per cent.; the maximum being higher and the average lower in some instances. In the case of The Gaslight and Coke Company, it is stated that of the total quantity of gas sent out, 38 per cent. was unmixed with water gas. In the case of one-ninth of the remaining 62 per cent., the maximum proportion of water gas was 35 per cent., and of the other eight-ninths 15 per cent. With regard to Liverpool, it is noted that a small proportion of the district was supplied with carburetted water gas unmixed with coal gas in the period for which the return is made; but none has been sent out unmixed since January, 1897.

Comparing the foregoing figures with similar returns for the previous nine years, it will be seen that the capital obligations of the Companies are as follows:—

Year.	Share and Premium Capital Paid up.	Loan Capital Issued.	Capital Sold under Auction Clauses.	Premiums Realized.
1887. . .	£31,556,788	£5,839,792	£3,354,093	£1,473,656
1888. . .	31,736,024	6,002,510	3,488,588	1,517,902
1889. . .	32,117,202	6,090,546	3,641,730	1,563,595
1890. . .	32,884,026	6,568,676	4,008,465	1,765,557
1891. . .	34,282,164⅓	6,862,117	4,300,266	1,823,068
1892. . .	35,266,898⅓	7,149,367	4,755,597	2,144,619
1893. . .	36,491,562⅓	7,544,563	5,417,667	2,432,970
1894. . .	37,059,199⅓	7,739,678	5,715,024	2,637,019
1895. . .	37,307,330⅓	7,888,086	5,974,455	2,779,604
1896. . .	41,432,325	8,185,710	6,783,468	3,512,818

Some of the other comparative details in the Companies' returns are—

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1887. . .	5,977,254	61,266,055,857	1,152,119	264,316
1888. . .	6,050,588	62,328,542,470	1,103,198	259,921
1889. . .	6,309,495	64,627,914,489	1,128,838	268,013
1890. . .	6,618,460	67,214,546,500	1,153,989	275,611
1891. . .	7,071,161	70,953,927,023	1,180,333	282,761
1892. . .	7,119,189	72,178,028,396	1,213,322	288,021
1893. . .	6,995,125	71,050,955,154	1,225,253	296,910
1894. . .	7,128,126	72,610,842,498	1,266,943	295,787
1895. . .	7,531,131	77,245,618,489	1,339,712	302,015
1896. . .	7,681,770	80,015,323,004	1,439,272	308,180

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1887 88 .	£20,081,435	£4,495,093	£3,161,604	£923,157	£439,467
1888-89 .	21,333,833	4,817,269	3,375,197	977,154	479,489
1889-90 .	21,669,789	5,067,843	3,627,578	971,755	486,483
1890-91 .	21,891,655	5,628,212	4,231,643	956,183	460,608
1891-92 .	22,476,180	5,906,319	4,589,109	965,533	397,947
1892-93 .	22,734,556	5,983,359	4,702,179	994,517	305,040
1893-94 .	23,619,082	6,219,460	4,866,486	1,038,462	341,470
1894-95 .	24,624,554	6,402,046	4,681,035	1,114,014	622,366
1895-96 .	25,624,326	6,478,191	4,881,944	1,126,170	493,886
1896-97 .	26,561,689	6,639,342	4,989,283	1,136,789	534,390

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1887-88 . .	2,985,577	30,105,457,962	1,011,139	159,264
1888-89 . .	3,204,982	32,381,124,770	1,089,748	174,191
1889-90 . .	3,353,516	33,453,368,830	1,115,267	178,867
1890-91 . .	3,623,967	35,796,491,799	1,143,289	184,773
1891-92 . .	4,148,131	37,740,332,448	1,172,704	192,323
1892-93 . .	3,977,291	39,303,250,095	1,203,574	201,484
1893-94 . .	4,025,167	39,730,833,247	1,226,332	210,316
1894-95 . .	4,191,175	41,684,838,142	1,257,274	217,069
1895-96 . .	4,406,315	44,176,134,202	1,320,059	224,873
1896-97 . .	4,614,969	47,026,280,408	1,406,456	232,464

"The Gas Engineer's Pocket-Book."—We have received from Messrs. Crosby Lockwood and Son a copy of the above-named work, which consists of "tables, notes, and memoranda relating to the manufacture, distribution, and use of coal gas and the construction of gas-works," compiled by Mr. Henry O'Connor, Assoc.M.Inst.C.E. The contents of the book, which occupy 411 pages, have been collected, the author tells us in his preface, from "every available source;" this being duly recorded wherever possible. He acknowledges his indebtedness to the "JOURNAL" for some of his matter; and the number of authorities cited shows that his reading has been wide and his diligence in recording memoranda remarkable. The result is that his book is a collection of useful hints and tables; but he has followed the diagrammatic form of tabulating wherever it has seemed to be preferable to adopt it. The matter is arranged under the two general headings of "Construction" and "Manufacture;" and in each case the various processes are taken in the order in which they occur in gas making. The first section opens with a series of mathematical and other tables; then the unloading and storage of materials and the construction of the several portions of the plant are dealt with; and this part of the book closes with some useful workshop notes. The second section includes information on distribution, testing, enriching processes, and the treatment of residuals. The glossary of terms in use in gas-works, in English, French, and German, is reproduced from Sugg's "Pocket-Book and Lighting Table;" and there is a full index. The book is neatly printed, bound in leather, and gilt edged.

WATER BILLS FOR 1898.

THE following Bills relating to water supply (promoted by Companies) await consideration by Parliament during the ensuing session:—

The Brompton, Chatham, Gillingham, and Rochester Water Bill is to enable the Company to make additional water-works, including a pumping-station at Luton, Chatham, and a service reservoir in Woolman's Wood. A public footpath leading from Starr Mill to Upper Luton is to be diverted. Additional lands are to be acquired. The works are to be completed within five years. The district of supply is to be enlarged so as to take in the parish of St. Margaret Extra. New capital to the amount of £60,000 is required, with the usual borrowing powers. Permission is sought to supply by meter.

The Clacton-on-Sea Gas and Water Bill is to incorporate a limited Company formed in 1875; a Water Order being obtained in 1876. The water limits are defined. New works are proposed, comprising wells and pumping-stations at Great Bromley and St. Osyth. The period for the compulsory purchase of lands is limited to five years; there is no limitation of time for the completion of the new works. Rates for domestic supplies are to range from 5½ per cent. upwards. Water may be supplied by measure. The Company desire to increase their undivided capital by £90,000.

The Cranbrook District Water Bill is to authorize the extension of the Company's limits of supply to include a number of parishes in the counties of Kent and Sussex, subject to the supply being made effective within five years. Additional works are to be constructed, including wells and pumping-stations in the parishes of Goudhurst, Rolvenden, and Hawkhurst. The works are to be completed in seven years. New capital to the amount of £35,000, with borrowing facilities to the extent of one-third, is required.

The Crawley and District Water Bill is to incorporate a new Company for the supply of water in a district of Sussex. Unexercised statutory powers are, after five years, to lapse to the Local Authority. The share capital of the Company is to be £30,000. The source of supply is to be a well and pumping-station to be situated in the parish of Ifield. The rate for domestic supplies is to be 7½ per cent. on the rateable value, with 9 per cent. for inns and schools. Supplies for other than domestic purposes are to be charged for at bulk prices. Provision is made for the conclusion of agreements with landowners for preserving the source of supply from pollution.

The Folkestone Water Bill is to extend the limits of supply to include the parishes of Newington, Hawkinge, Alkham, Capel-le-Ferne, and Lydden, which is to be effected within seven years. Two additional pumping-stations are to be constructed in the parishes of Lydden and Alkham respectively. The works are to be completed within ten years. Additional lands are to be acquired. Further capital to the amount of £200,000 is needed, with the usual borrowing powers.

The Forres Water Bill is to confer statutory advantages upon a limited Company formed in 1845 with the object of supplying water to the Royal Burgh of Forres, in Elginshire. The water limits of the Company are to be the parishes of Forres, Rafford, and Dallas; but those of compulsory supply are only Forres borough. The capital of the Company is to be £12,000, whereof £6000 is to be new capital. The old capital is to be converted into consolidated ordinary stock. All the capital is to bear a uniform 6 per cent. dividend. New water-works are contemplated, including the conversion of Loch Romach into a storage reservoir. The waters of the Black Burn are also to be taken, subject to the discharging down the stream of compensation water amounting to 172,800 gallons daily in a continuous and uniform flow during the 24 hours. The works are to be completed within seven years. Sporting rights on the site of the reservoir are reserved to the landlord. The rate for domestic supplies is to be 1s. 6d. in the pound, subject to certain exceptions. All supplies may be by measure. A schedule gives a detailed list of the lands owned by the limited Company.

The Hartlepool Gas and Water Bill is to enable the Company to raise £150,000 additional water capital, with power to borrow £37,500. An impounding reservoir is to be constructed upon Amerston Beck, and another on Dalton Beck. The additional lands are to be acquired within five years, and the works constructed within ten years.

The Haslemere District Water and Gas Bill proposes to incorporate a new Company, partly for the purpose of supplying water in the district named. If the powers are not exercised within five years, they are to lapse to the Local Authority. The source of supply is to be a well and pumping-station in the parish of Frensham. Rates for domestic services are to range from 9 to 7 per cent., with the higher rate for inns. Part of the district is to be taken out of the Frith Hill, Godalming, and Farncombe Water Order, 1886.

The Higham and Hundred of Hoo Water Bill is to extend the period within which the Company must supply certain parts of their district from seven years, as enacted in 1890, to ten years from the same date. The rate of interest payable on consumers' deposits is to be reduced to 4 per cent.

The Maldon Water Bill is to incorporate a Company formed in 1862, by the name of the Maldon Water-Works Company. Additional capital to the amount of £16,550 is required, to bear a 7 per cent. dividend and carry the usual borrowing powers. Additional works are to be sanctioned, including a water-tower. Rates for domestic supplies are to range from 1s. 6d. to 1s. 2d. in the pound; inns to be charged 9 per cent. Prices are quoted for meter supplies. Water for sanitary purposes is to be furnished to the Corporation at 1s. 6d. per 1000 gallons.

The Mid-Kent Water Bill is to incorporate a limited Company formed in 1888. The present share capital consists of £33,000; and the Company have borrowed £8000 on debentures and £7000 on loan. The district of supply is defined. The statutory powers are to lapse to the Local Authority if not exercised within six years. The capital of the Company is to be increased to £135,000. Borrowing powers are sought to the extent of £8000 in respect of the original capital of £33,000, and to one-fourth of the amount of the new issue. The source of supply is a well and pumping-station in the parish of Halling. It is desired to prohibit the sinking by other parties in the district of any wells that might interfere with the Company's supply. Rates for water used for domestic purposes are to range from 7½ to 6 per cent. on the rateable value, with 25 per cent. extra for high service above the level of the authorized water-tower. All supplies may be by measure. Certain parts of the district are to be struck out of the South Kent Water Act, 1889, and the Higham and Hundred of Hoo Act, 1890.

The Newcastle and Gateshead Water Bill is to sanction the construction of additional works necessary for the more effective utilization of the resources of the undertaking. These include a number of new pipe-lines and tramroads to be completed within seven years. The tramways may be worked by mechanical power. The time prescribed by the Company's Act of 1894 for the completion of a certain work is to be extended to 1908. Additional 5 per cent. capital to the amount of £480,000 is required, with the usual borrowing powers.

The Newhaven and Seaford Water Bill is to incorporate a limited Company formed in 1881. The capital at present is £30,000; and debenture bonds to the amount of £3000 have been issued. The limits of supply are extended. The statutory powers are to lapse if unexercised for five years. The capital is to be increased to £60,000. New works are to be authorized, comprising a pipe-line and a service reservoir in the parish of Piddinghoe.

The North Warwickshire Water Bill is to incorporate a new Company for the supply of water to the parish of Foleshill and its vicinity. The statutory powers must be exercised within five years. The capital of the Company is to be £36,000, in ordinary or preference shares, with power to borrow £12,000. Clause 23 runs as follows:—

> No person shall be disqualified as a director by being a member of any County, Urban or Rural District Council within the limits of this Act, or Justice of the Peace for the division within which the works may be situate; and no shareholder of the Company shall be disqualified as such member by reason of any contract between the Company and the Council: Provided always that no member who is a director or shareholder or holder of debenture stock shall act or vote at any meeting of such Council on any question or with reference to any matter in which such director or shareholder has direct or indirect interest as a shareholder.

The source of supply is to be some wells in the parishes of Corley and Keresley; and the works are to be completed within seven years. Rates for domestic supply are to be at 8 and 7 per cent. of the rateable value, with 9 per cent. for inns.

The City of Norwich Water-Works Bill is to enable the Company to raise £100,000 of additional 6 per cent. capital, carrying the usual borrowing powers. New works are to be constructed, the most important of which are a subsiding tank and filter-beds adjacent to the Heigham pumping-station; and a service-tank at Mousehold. The additional land is to be acquired within five years, and the works completed within fifteen years.

The Rhymney and Aber Valleys Gas and Water Bill is to provide among other things for an improved water supply to the district named. The water capital is be £200,000. The undertaking of the Rhymney Valley Gas and Water Company is to be purchased; also the water undertakings of the Rhymney Iron Company, and the Caerphilly and New Tredegar Gas and Water Companies. Additional water-works are to be constructed, including an impounding reservoir on the Nant Pitgwellt Brook, and another reservoir on the Rhymney River. The land is to be acquired within five, and the works completed within seven years. Provision is made for compensation water. Rates for domestic supplies are to range from 10 to 6 per cent. Water may also be furnished for all purposes by measure. The period limited by an Act of 1897 for the completion of certain works of the Rhymney Valley Company is to be extended for two years.

The Sheringham Gas and Water Bill is to incorporate a Company formed in 1887, and actually supplying water in the parishes of Sheringham and Beeston Regis, in Norfolk. Any statutory powers not exercised within five years are to lapse to the Local Authority. The original water capital was £6000; and to this £12,000 is to be added. Separate accounts of the undertakings are to be kept. Additional land is required for water purposes. All supplies may be by measure. Domestic rates are to remain as fixed by an Order of 1888.

The Southend Water-Works Bill is to extend the limits of supply to include the parishes of Bowers Gifford, Vange, and Fobbing, to be made effective within ten years. Additional works are contemplated, including wells and pumping-stations

to be situated in the parishes named above. The additional lands are to be taken within five years, and the works constructed within fifteen years. Additional 5 per cent. capital is needed to the amount of £176,000, to carry the usual borrowing powers.

The Southwark and Vauxhall Water Bill is to enable the Company to construct additional works comprising two storage reservoirs and a pumping-station at Walton-on-Thames, with proper connections to Hampton. Subject to restrictions set out in detail, the powers of the Company in regard to taking water from the River Thames are to be increased. Authority is sought to issue £650,000 of additional debenture stock, redeemable after 25 years. The sinking fund arrangements now usually imposed on the London Water Companies are to apply to this issue.

The Staines Reservoirs Joint Committee Bill is a measure to amend the Act of 1896 in various respects. Two of the authorized reservoirs are to be enlarged, and additional lands are to be acquired. Power is sought for exchange of land between the Committee and the Staines Urban District Council. The River Ash at Staines is to be diverted. The nominal amount of the Staines Reservoirs Guaranteed Debenture Stock is to be increased to £1,250,000. Trustees are to be enabled to invest in this stock, as though it were debenture stock of each of the contributing Companies.

The Wey Valley Water Bill is to incorporate a limited Company formed for the purpose of supplying a district on the borders of Surrey and Hampshire. The capital of the Company is to be £30,000, with the usual borrowing powers. The source of supply is a well and pumping station in the parish of Crondall and two other wells in the parish of Frensham. Rates for domestic supplies are to range from 9 to 6 per cent. The charge for large public institutions is to be by agreement, or as determined by a County Court Judge. Water-fittings are to be removable from houses left empty for more than three months. The district of supply of the Frimley Company is extended, and certain acts done by the Company in excess of their statutory rights are to be sanctioned. The Frimley Company are to be authorized to raise £15,000 additional capital, and to enter into certain mutual arrangements with the Wey Valley Company. The district of the Farnham Company is also to be extended, and certain acts of theirs confirmed. The Company are also to be permitted to raise £5000 additional capital. Seven of the local Companies are to be enabled voluntarily to enter into mutual arrangements.

The Wymondham Water Bill is to incorporate a new Company for the supply of water in a district of Norfolk of which the parish of Wymondham is the centre. The statutory powers are to lapse in five years if not exercised. The capital of the Company is to be £16,000, with borrowing powers to the extent of one-third of the issue. Clause 23 is the same as in the North Warwickshire Bill. The source of supply is to be a well and pumping-station in the parish of Wymondham. Rates for domestic supplies are to be 9 and 7 per cent., with the maximum for inns. Interest at the rate of 5 per cent. is to be paid on all money deposited as security for meters. Meters are to be kept in repair by the Company. Powers of entry to buildings and inspection of fittings are desired.

OBITUARY.

Mr. Henry Hutchinson, one of the Directors of the Sheffield United Gas Company, died last Sunday week, at the advanced age of 85.

Mr. Jeremiah Paine, who held the position of Deputy-Chairman of the Sutton Valence Gas Company from its commencement in 1866 up to 1889, died at East Sutton on the 13th ult., having reached within a month the great age of 86 years.

The Salcombe Gas Company have lost the services of a useful Director by the death of Mr. W. S. Hannaford. The deceased, who was 68 years of age, occupied many other public offices, among them that of Chairman of the District Council.

The death is announced of Alderman R. Toole, the Deputy-Chairman of the Dublin Corporation Water Committee and a member of the Electric Lighting and Special Gas Committees. He was much respected by his colleagues, and was an earnest co-operator in their work.

The death occurred last Wednesday, in his 74th year, of Sir Windham C. J. C. Anstruther, Bart., of Carmichael, in the Upper Ward of Lanarkshire. Deceased was an indefatigable worker in county affairs, and will be much missed in the County Council, of which he was the Chairman. In the year 1874 he successfully contested the Southern Division of Lanarkshire in the Conservative interest, and while he was in Parliament he assisted in carrying many useful measures, conspicuous among them being the Burghs Gas Supply (Scotland) Act, which allows burghs in Scotland to take over the gas supply—one of the most notable Acts of Parliament passed in recent times. In drafting and carrying that measure, he was assisted by the Town Clerk who then managed the legal affairs of the Burgh of Wishaw.

The professional friends of Mr. T. H. Martin, the Engineer and Manager of the Barnet Gas and Water Company, will learn with deep sorrow, as we have done, of the great loss he has sustained by the death of his wife. Mrs. Martin (who was 50 years of age) was taken ill with influenza on the 13th ult.; and, though medical assistance was immediately procured, it was not for a moment thought that her illness was of a serious nature. Up to the Thursday before she died, the condition of the patient improved; but then a change for the worse set in. A London physician was at once called in, in consultation with two local doctors who had been in attendance from the outset; and everything that medical skill could suggest was done for the sufferer. In spite of all efforts, however, death supervened from post-influenza, in the early hours of Sunday of last week. Mrs. Martin's unexpected death has caused widespread regret in the district; and much sympathy is felt for Mr. Martin and his family in the severe trial which has befallen them. The funeral took place last Wednesday.

PERSONAL.

Mr. H. Smith has been selected to fill the position of working Water Engineer to the Guildford Corporation, in succession to Mr. C. H. Adams, who sent in his resignation towards the close of last year. Mr. Smith will enter upon his duties next Saturday.

Mr. W. Matthews, the Water Engineer of the Southampton Corporation, has had his salary raised to £450 per annum; being an addition of £40. Mr. Matthews was appointed to his present position in 1884; and since then he has undertaken works representing an expenditure of £105,000.

On the evening of the 13th ult., the President of the Ottawa Gas Company, Mr. John Coates, M.Inst.C.E., gave a dinner to the employees of the Company, and delivered an interesting address, in which he pointed out the value of steadiness, industry, and perseverance to every man who desires to rise in the social scale. He cited a number of instances of men who from humble positions had risen to eminence; and concluded by urging the employees to do their best for the Company, who, he said, would not forget them in old age.

On receiving the appointment of Chemist and Superintending Gas Examiner to the London County Council, Dr. Frank Clowes has been elected Emeritus Professor of Chemistry in the University College, Nottingham. He will thus retain his title and status, though no longer performing professorial duties. This honorary position has been conferred upon Dr. Clowes in recognition of the valuable services rendered to the College by him—first in organizing the Chemical Department, and afterwards for sixteen years discharging the duties of Chemical Professor, and for three years the duties of Principal.

NOTES.

The Mixture and Density of Gases.

At a recent meeting of the Academy of Sciences, Mr. Leduc submitted a communication in which he proposed to replace Dalton's law, that the pressure of a mixture of gases is equal to the sum of the pressures that each would occupy in the same receptacle, by another—that the volume occupied by a mixture of gases is equal to the sum of the volumes that the component gases would occupy under the conditions of pressure and temperature of the mixture; the two statements being only identical when Boyle's law holds exactly. On the same occasion, M. Schlœsing, jun., dealt with the subject of the determination of the density of gases in very small volumes. The method described by the author is stated to give very fair results with quantities of gas as small as 6 c.c., and requires the use of neither a barometer nor a balance. A column of the gas of which the density is to be determined is balanced hydrostatically against a column of gas of known density and absorbable by caustic potash, such as carbon dioxide.

The Origin of Petroleum.

The question of the origin of petroleum has been discussed by Herr K. W. Charitschkoff; and his conclusions are summarized by Mr. C. Salter in the "Journal of the Society of Chemical Industry." The author, who is a supporter of the inorganic theory, approaches the subject from the standpoint that the occurrence of nitrogen in petroleum is not an unassailable proof of organic origin. He considers that the presence of nitrogen compounds is capable of explanation without resorting to an organic theory of origin, since modern research is continually affording instances of the direct combination of nitrogen with various substances, particularly in processes of combustion occurring in presence of this element. He believes the formation of petroleum to be effected at depths not very remote from the earth's surface, and that, under such circumstances, it is not impossible for the nitrogen compounds to have resulted from subsidiary reactions going on in presence of nitrogen either in a free state or dissolved in sea water. The accuracy of this view will, he believes, be confirmed as future research enlarges our knowledge of the chemistry of nitrogen.

A Down-Draught Boiler Furnace.

The idea of a down-draught furnace, in which the air needed to support combustion is admitted over the fuel-bed and not under the fire-bars, is a familiar one; but for various reasons the principle has never been largely adopted in practice. There

happens to be on the American market a furnace of this type, particulars of which are given in the "Journal of the Franklin Institute," in connection with the attempt that is being made to suppress the smoke nuisance in Philadelphia. The Hawley down-draught furnace, as it is called, consists essentially of an upper or water grate, carrying the supply of raw coking coal, and a lower or common furnace grate, upon which the coked coal is burnt. The upper grate has the down-draught; and the greater part of the air needed for combustion is passed downward through the fuel upon it. No coal is ever fired directly upon the lower grate. The water-grate consists of charcoal iron 2-inch pipes, connected to 10-inch cross headers. The tubes slope towards the front; and as the front header receives water from the coldest, and the back header is connected to the hottest part of the boiler, there is a brisk circulation through the pipes. The same method of preserving the pipes of the water-grate has always been adopted in similar circumstances. Many and various advantages are claimed for the Hawley furnace as applied to steam-boilers, and among others the property of burning a cheap kind of bituminous fuel without smoke. It may be remarked that the first cost and wear and tear of a furnace of this kind must be heavy; while no so-called improved boiler furnace that does not include mechanical stoking can be regarded as modern in type.

The Steaming Capacity of Boilers.

What is a boiler horse power? The question is suggested by the report of the Committee appointed by the American Society of Mechanical Engineers to revise, if necessary, the standard method of making boiler tests. The Committee of 1885 accepted as the unit of horse power of a boiler the value adopted by the judges of the Centennial Exhibition, which was the evaporation of 30 lbs. of water from a temperature of 100° Fahr. into steam at 70 lbs. gauge pressure, corresponding to the transfer or absorption of 33,305 British thermal units per hour. This was called a "commercial horse power." The new Committee make the horse power the evaporation of 34·5 lbs. of water from and at 212° Fahr. This is equivalent to the transfer of 33,317 British thermal units per hour—not a noticeable difference, but a more scientific way of stating the unit. It is hereupon suggested by "Power" that it would be a still further improvement to get rid of the 34·5 lbs. altogether, and with it the term "horse power" as applied to a boiler, with which it has no rational connection. A boiler is simply an apparatus for furnishing steam, in most cases to an engine; and it is the type and efficiency of the latter that gauge the capacity of the former in respect of the number of "horse power" units supplied. Hence the capacity of a boiler should be stated directly in terms of the pounds weight of steam it can furnish per hour, reduced to the standard from and at 212° Fahr. for uniformity and comparability. There is no sense in dividing this quantity by 34·5, and calling the quotient the horse power, when, if the boiler is to supply power at all, the engine may require anything from 13 lbs. to 100 lbs. per indicated horse power. Upon the former suggestion, a 100-horse power boiler would be called a boiler capable of evaporating 3450 lbs. of steam. Thus we should soon get into the way of speaking of "three thousand pound boilers," or "twenty-five hundred unit boilers," which would at least be rational.

The Competition of English with Foreign Coal.

The "Proceedings" of the Institution of Civil Engineers for the past year contained some particulars on the above subject derived from the "Archiv. für Post und Telegraphie." It appears therefrom that anxiety is being caused in German commercial circles, owing to the fact that the export of coke and coal from England to Germany is growing more rapidly than the gross English exports of these materials. The gross export in 1895 was 33,112,000 tons, or 38,000 tons more than that of 1894; while the export to Germany in 1895 was 4,144,000 tons—an increase of 25,000 tons over that of 1894. For the nine months, January to October, 1896, the increase in the gross exports was only 4 per cent.; while the increase in the exports to Germany during that period was 14 per cent. The annual consumption of coal and coke per head of the population in Great Britain increased 660 lbs. between the years 1875 and 1895; while the corresponding increase in Germany amounted to 1980 lbs. The production of coal in the colonies and foreign possessions of Great Britain is increasing; the total in 1894 amounting to 11,368,000 tons. India produced only about 1,320,000 tons in 1883; but in 1895, a total of 4,396,000 tons. The small output of coal in South Africa is also increasing. It is pointed out that Japan is becoming a serious competitor for the coal trade of East Asia—her output already amounting to 1,400,000 tons. It is stated that the Germans have begun to work the coal-fields in Amoy, and the Chinese the Nankin fields. The bulk of the Russian output of 8,667,000 tons is produced by the Don fields. England supplies almost all the coal used in Italy, 50 per cent. of that used in Spain, and 11 to 12 per cent. of that used in France; but English coal cannot now be delivered and sold at a profit in the Black Sea. The Scandinavian peninsula obtains 90 per cent. of its coal from Great Britain. Coal can be delivered to the German coast more cheaply from Great Britain than from the German coal-fields; and the output of the German pits does not keep pace with the home demand.

COMMUNICATED ARTICLE.

SOME REMARKS ON STANDARDS OF LIGHT.

By "Veritas."

There are some people existing in this mundane sphere who regard photometry as an exact science. Writing as one who has had considerable experience, to use a colloquial phrase, I beg to differ. A definite issue may be raised as to some new standard of light; and two or three experts acting independently arrive at quite different conclusions. As a desperate resource, a committee of experts may be appointed; and though a report may be eventually issued after long delay, occasioned by strong differences of opinion, the published document is found to be simply a compromise.

The difficulties in practical photometry are very great. There is not only the matter of a reliable standard of light, but there is also the question (too frequently omitted) of the conditions under which the gas should be tested in order to afford the truest and the most just results. For official purposes, in connection with public gas supply, it is undoubtedly absolutely necessary to have a fixed standard of light and a definite prescription as to burner, consumption, &c. Under the present *régime*, we have (so-called) standard candles on the one side and a Sugg "London" argand, with a 2-inch by 6-inch chimney, and a fixed consumption of 5 cubic feet of gas per hour on the other. Modern developments present us with two factors acting on both sides. In the first place, candles as a standard of light are unsatisfactory, and might be replaced by something much more reliable. In the second place, the rigid adherence to the rule of an absolute 5-feet consumption in a Sugg "London" argand is grossly unfair, as the prescription does grave injustice to the gas when it drops below the nominal 16-candle value. With regard to the latter consideration, we have also to remember the vast improvements which have taken place in the development of light within a comparatively few years. The gas supplied to the public is still tested by a burner, which, in its time, was considered to develop more light from the gas than the ordinary burners then available; but we have now in the regenerative burners, and more especially in the various forms of incandescent burners, a development of light in proportion to gas consumed far in excess of what was dreamed of in past years.

These remarks are simply preliminary to the main question—viz., that we require a more reliable standard by which to have the public gas supply valued, and that it would also be desirable by some alteration of burner or conditions of testing, to modify the existing official prescriptions. It is no doubt hopeless at the present time to expect any change on the latter question; but in regard to some substitute for sperm candles, it may be more in the immediate future to hope for an alteration which will afford a more reliable standard. The Dibdin ten-candle standard seems at the present time to afford the nearest approach to a solution of the question, though for ordinary technical work there is no doubt that the Methven screen is the most convenient. The only objection to the Methven screen as applied to testing gas, is that its value is vitiated, and its results become untrustworthy, in the case of carburetted water gas, which is now so rapidly coming into favour. The question of the adoption of a new standard must necessarily have reference to its equivalence to the older ones in existence. This must be compulsorily under all conditions, whether for abstract scientific purposes, or for the valuation of the public gas supply. For the latter purpose, all the precautions necessary for the maintenance of scientific accuracy are emphasized by the fact of the large issues concerned between the gas companies and the public with regard to the due and proper fulfilment of parliamentary requirements. With gas companies working under the sliding scale, any increased exigency as to maintaining a higher illuminating value must mean greater cost of production, and a less possibility of reducing the price of gas to the consumer; and it is a very doubtful question whether, considering the cost of enhancing the lighting value of gas above a certain limit, and the corresponding necessity of an advance in price, the consumer would, as a balance, derive any benefit.

This is the exact condition in which the suggested substitution of the ten-candle Dibdin standard for sperm candles has placed both parties—viz., consumer and producer. The original Dibdin standard (so-called 10 candles) was found to be equivalent to about 10·8 Miller candles in use at the time of the investigations of the Standards of Light Commission. A compromise was eventually effected, in which the height of the screen attached to the Dibdin standard was lowered so as to decrease the proportion of light emitted by the burner for testing purposes. Trusting to memory, and without reference to official documents, the Dibdin standard was eventually set at equal to between 10·3 and 10·4 Miller candles. This arrangement, although accepted as a compromise between opposing parties, was distinctly unsatisfactory to gas companies in general, as, if adopted, it would give a pronouncedly deteriorated value to the gas which they supplied in comparison with that indicated by the ordinary sperm candles in general use. The compromise was mainly effected on the grounds of an allegation that the standard candles at present in use did not afford as much light as those employed when the original Gas Acts were passed, and the respective

companies accepted their obligations to supply 14 or 16 candle gas. It is to my mind very doubtful that this gross charge against the apparently innocent candle has been duly substantiated. This, at least, was admitted—that the valuation of the average light of a candle was in the old days mainly taken on the one-candle pentane unit; and it was subsequently allowed that the aforesaid one-candle pentane unit could give different results according to the conditions of the particular experimenter. The unsatisfactory compromise between the local authorities and the gas companies has never proceeded further; and, to the best of my knowledge, no steps have been taken to procure any alteration in the existing standard of sperm candles by an application to Parliament, which is necessarily the only course open. Possibly both sides are nervous; the local authorities especially feeling the powerful opposition which would be brought to bear by the whole of the gas industry in a matter so vitally affecting their interests.

Omitting the question of the rating of the Dibdin standard as to its equivalence in ordinary sperm candles, I am strongly in favour of its being a reliable standard of light; and my only regret is that the opposition side to the gas companies could not accept such a modified form as to be equal to ten average candles at present in use. Had this been done, there would have been perfect accord between the two parties, and the proposed new standard might by this time have become an accepted fact. There is one special point in favour of a constant standard of light of an easily manipulated character, as against candles. Whereas the latter give the most fluctuating results—and it is now a matter of history that (nominal) 16-candle gas may be recorded as 15 or 17 candles—a constant standard will afford a uniform result. The investigations of the Standards of Light Commission at least endorsed the accuracy and the uniformity of results obtainable from the Dibdin ten-candle standard; and it has been left to the special report of the Incorporated Institution of Gas Engineers (published in the "JOURNAL" for the 18th ult.) to discover details which eluded the scientific intelligence of a large body of experts, who devoted a careful and prolonged research to the subject. Without making any allegation as to the efficiency of the gentlemen who have signed this preliminary report, and without entering into any criticism of their figures, but simply confining myself to their summary, I must candidly confess that their conclusions are most extraordinary and most inexplicable; and that they would be received by one who has had as much experience on the subject as I have, with a large amount of scepticism.

That the proposed standard (10-candle Dibdin) is of greater value than ten average standard candles, we all know; and this fresh information is simply superfluous. The question of the selection of a suitable chimney is a frivolous matter. The Dibdin standard only requires the proper size in height and diameter, in exactly the same way as the Sugg "London" argand, or any other standard of light. A further conclusion is that the standards which may agree with each other on one particular occasion, do not give the same results from day to day. Why not? and who among the mixture of genuine and *quasi* photometrists is responsible for this opinion? Another statement is to the effect that the light value of two standards removed from one end of the photometer bar to the other give different results. Can our recent experts explain this? and it is also true for the Methven screens? As to the allegation regarding a change in light value by an alteration in the height of flame, it is well known that the flame has to be kept within certain limits; but these are sufficiently liberal for anyone, even with a limited knowledge of photometry, to conform to. I doubt very much whether the temperature of the atmosphere affects the question, though bad ventilation or draught no doubt does.

As to clause 3 in the report I cannot express any definite opinion, except that I believe that Mr. Dibdin has most confidently stated that, whether air or gas is saturated with pentane vapour, the light is the same. Clause 4 is somewhat peculiarly worded. As it stands, it would utterly annihilate any idea of the adoption of the Dibdin 10-candle standard. If the chimney has to be standardized with the burner, what would happen if a gas examiner accidently broke a standardized chimney, and had to replace it with one conforming to the ordinary accuracy of measurements of height and diameter?

In conclusion, I can only add that it may be seriously a matter of doubt whether this most recent investigation on the subject of a new standard has given us more *light?* I do not wish to be too sarcastic, but it seems a fitting sequel to my previous comments to finish with a well-known quotation, substituting the term "committee" for "gentlemen": "The honourable Committee has said much that is true and much that is new; but, unfortunately, that which is true is not new, and that which is new is not true."

The Discovery of Natural Gas at Waldron.—It appears that no attempt has been made to utilize the natural gas which was discovered at Waldron not long ago by Mr. Dawson, when in quest of geographical information. Tests which have been made have shown the gas to be a good illuminant; and surprise has been expressed at no steps being taken to make use of it for lighting Heathfield Station, on the London and Brighton Railway, which is close by, and where oil-lamps are employed. Samples of the gas have been taken for analysis by Professor Hewitt, of the Technical College of Chemistry.

TECHNICAL RECORD.

CHEMICAL PROCESSES IN GAS-WORKS.

At the General Meeting of the Association of German Chemists at Hamburg last year, a lecture was given by Dr. W. Leybold, and it has since been printed in the "Zeitschrift für angewandte Chemie," under the above title. There were many suggestive points in the lecture; but as it was very long, and addressed to a gathering of general chemists rather than to gas engineers, we purpose indicating here only the nature of the ground covered and the more pertinent observations made by the lecturer.

The position held by gas manufacture among chemical industries is a prominent one; and yet the first gas-works in Germany was built as late as 1825 at Hanover. Gas has not even now been adopted in German towns to the same extent as in English and even Belgian centres of population. This is evident from the fact that the 600,000 inhabitants of the flourishing city of Hamburg consume only 2500 cubic feet of gas per head; whereas 191,000 inhabitants of Brussels consume over 6000 cubic feet per head per annum. Chemists take only a small part in the manufacture of gas—though admittedly it is a branch of chemical industry—and only the largest works, or those where some peculiar description of gas is made, give employment to a chemist. Yet from the purchase of coal to the selection of burners, there is an almost unbroken field of labour for him. His operations naturally should fall in two categories—viz. (1) those concerned with the supervision of the gas distributed, and (2) those serviceable in its manufacture or in the valuation of products.

With regard to the supervision of the gas, observations of its illuminating power will generally form an important part of his work, since either bad or good gas may be produced from the same description of coal, according to the heats of the retorts. Next he has to ascertain the amount of sulphur in the gas distributed. The last trace of sulphuretted hydrogen has to be removed; and the amount of sulphur in other forms should not be excessive. If English coal containing a large proportion of sulphur is carbonized, and the method of lime purification which is customary in England is not used, the sulphur will cause much injury in rooms where the gas is burnt. But in Hamburg, for instance, the assistance of the chemist has resulted in the selection of coals which furnish a very small amount of sulphur to the gas—and, indeed, the maximum of 22 grains of sulphur per 100 cubic feet of gas which is permitted in London is not exceeded. The determination of the carbonic acid in gas is not of importance in works where purification by lime is not practised. The ammonia in 100 cubic feet of well-scrubbed gas does not now usually exceed 0·1 grain, though according to the regulations as much as 4 grains is permitted even in London. The calorific value of gas has recently become of immense importance, and is generally ascertained by Junkers' calorimeter.

The second branch of the laboratory work on a gas-works naturally is primarily concerned with the examination of the coals. An experimental gas-works is indispensable; and each consignment of coal delivered by rail or water is tested for yield of gas. The amount of sulphur in, and the illuminating power of, the gas are also ascertained. The yield of coke, and the amount of ash in it are determined; and the percentage of water and sulphur in the coal and coke are estimated. The distribution of the sulphur in the coal among the products of its carbonization is then calculated from the results of the determinations. For tests of rich cannel, it should be remembered that the enrichment value of the gas is considerably higher than its illuminating power found directly. The fish-tail burners usually employed for burning cannel gas during testing do not develop its maximum luminosity; and better results can be secured by observing the increase in the illuminating power of coal gas when 10 per cent. of the cannel gas under test is added to it. But the results obtained in practice are even higher than found by this method, because the gases mix either in the retort or the hydraulic main, and the coal gas carries along with it hydrocarbons which pass into the tar when the cannel is carbonized alone.

Recently the examination of liquid carburetting agents—such as benzol, benzoline, carburine, or other hydrocarbon—has become necessary. The examination usually consists merely in a fractional distillation to determine the amount of the material which is not volatile below 212° Fahr. The carburetting apparatus generally used in gas-works is heated by steam; and it is therefore impossible to vaporize any considerable quantity of liquid which is not volatile below 212° Fahr. The enriching value of the liquid can also be determined on the small scale. If, however, the liquid is difficultly volatile, the results will not agree, but if it be benzol or benzoline they will agree fairly, with those obtained on the working scale. The amount of sulphur, especially in the form of carbon bisulphide, is of great importance with some carburetting liquids, such as benzol. Smokeless combustion of these liquids appears unattainable, so the sulphur cannot be estimated in the products of combustion by an apparatus such as that of the Metropolitan Gas Referees for the determination of sulphur in gas. The only method of determination available appears to be the conversion of the carbon bisulphide into potassium xanthogenate—*i.e.*, by

the action of an alcoholic solution of potash on the carbon bisulphide—and the decomposition of that salt by means of bromine. Checked against sulphur determinations on coal gas before and after carburetting, this method gave correct results for benzol. Benzoline appeared quite free from sulphur.

The purchase of oxide of iron for purification is an important matter, as the descriptions in the market vary greatly in efficiency. Some natural ores contain so much fibre that they answer well without addition of sawdust or chips. An artificial mixture of precipitated ferric hydrate and alumina, somewhat alkaline owing to excess of soda having been used for the precipitation, is known as Lux's Material, and is largely used, though it needs the addition of sawdust. Sulphuretted hydrogen reduces the ferric hydrate in the purifiers to the ferrous state, and sulphur is set free; and then the ferrous oxide is converted by sulphuretted hydrogen to sulphide. Even before revivification of the material, sulphur can be extracted by means of carbon bisulphide; and thus it is clear that the reaction occurs in the above simple manner, instead of according to the complex formulæ given in literature on gas. [Dr. Leybold appears to be in ignorance of the classical research of Mr. Lewis T. Wright, by which it was shown that the reaction he mentions occurs with only from 17 to 30 per cent. of the sulphuretted hydrogen taken up, and that the remainder combines to form ferric sulphide, in the production of which no sulphur is set free.*] The chemist frequently has to pronounce whether or not revivification of the oxide is complete, as with material which has been fouled a few times change of colour is not sufficiently clear to serve as a sure indication. He can easily do so by measuring the volume of sulphuretted hydrogen which he can set free from a known quantity of the oxide in question. Or, on aspirating gas from the middle of the heap by means of a tube, the presence of oxygen in the aspirated gas will indicate that revivification of the material is complete. A small quantity of sulphate is frequently formed at each revivification, and combines with ammonia if it be present, or in its absence with the oxide, which thus acquires an acid reaction and becomes inefficient. The cause of the formation of sulphate is not precisely known.

Attempts to effect the revivification of oxide in the purifying vessels were for the most part unsuccessful, owing to the difficulty of controlling the action. Brin's Oxygen Company initiated in England revivification by means of an addition of oxygen to the crude gas; and trials proved very successful at Ramsgate and elsewhere. But the high cost of the plant for producing oxygen, prevented the general adoption of the process. About 2 per cent. of air was then used in place of pure oxygen; and the injury caused to the illuminating power of the gas by the introduction of the atmospheric nitrogen, was found to be nullified if the air was introduced at the hydraulic main, where it became saturated with hydrocarbons. The maximum amount of air that can be applied is 3 per cent.; and by its introduction a great saving in wages results, and purifying vessels work for five or six months without recharging. But the material is kept warm in the purifiers, and therefore becomes hard and dry, so that a pick has to be used to remove it from the vessels. This inconvenience is also felt in connection with another process which will be considered next.

At the exhibition held in London in 1862, Gautier-Bouchard obtained distinction for the production of prussian blue from spent gas lime. Soon afterwards, ferric oxide began to replace much of the lime previously used for the purification of gas; and it is now extensively employed, though Weldon-mud has been introduced lately in a few works. It is worthy of note, however, that the London Gas Companies are constrained to use lime, as in the form of a polysulphide of calcium it is the only material practically available for the removal of a portion of the carbon bisulphide from the crude gas. Formerly gas was not thoroughly washed, and ammonia as well as sulphur could be recovered from spent oxide. The ammonia favoured the formation of sulphocyanide in the oxide; and at first sulphocyanides were thus obtained. But as the washing of the gas became more nearly perfect, less ammonia reached the oxide, and prussian blue was formed in it. The blue collected in the material until it sometimes formed as much as 11 to 12 per cent. of the mass, and gave it a value four to five times as great as that of the original ferric oxide. The working up of the spent material was first rendered easy and reliable by the method of ferrocyanide production patented in 1883 by Kunheim. During last year, however, a falling off in the demand for potassium cyanide for gold extraction has depreciated the value of the spent oxide, as has also the preparation of cyanides by other methods. The hydrocyanic acid in the crude gas was never completely obtained in the spent oxide, as under the most favourable conditions one-third of the total passed on in the purified gas; and in works with purifiers of inadequate capacity, very little indeed was retained in the oxide. In order to secure spent oxide containing a high percentage of cyanogen, it is essential that the purifiers be of ample capacity, so that the rate of flow of the gas is low, that the ammonia be completely abstracted in the washers, and that undue heating be avoided during revivification. A small percentage—say, 1 to 1·5—of air may be added to the gas without any injury to the extraction of cyanogen. If the percentage approaches 3, the oxide becomes over-dry, and about 60 per cent. of the cyanogen escapes absorption. Knublauch's process for extracting cyanogen by washing the gas with alkalies to which iron salts have been added, does not appear to have been adopted.

The gas chemist has therefore ample work in connection with purification; but the ammonia of the gas affords him almost as large a field of operations. The profit obtainable from ammonia abstraction has, indeed, become inconsiderable. But it is quite possible to employ washers by which nearly the whole of the ammonia can be removed; and the mixed liquor from condensers and washers contain from 1·8 to 2 per cent. of ammonia—*i.e.*, the liquor will be from 8·3 to 9·2 oz. strength. Loss of ammonia to the liquor may easily ensue if the tar and liquor wells are not large enough to allow complete deposition of the tar to take place before the tar and liquor are drawn off. Thus it frequently happens, when English coals are carbonized, that the tar contains 12 per cent. or more of liquor. In most gas-works, the liquor is worked up to sulphate of ammonia or concentrated gas liquor; and the supervision of this process naturally is left to the chemist. With regard to the tar, it is usually sold in Germany to chemical works; and the only stipulation made is that it shall not contain too large an amount of water. Shiploads of tar are, however, sent from Hamburg to England.

There are very many other tests which the chemist in a gas-works undertakes—such as the examination of incandescent burners, automatic lighters, petroleum, glycerine for wet meters, fire-clays, and boiler feed-water. Also calorific tests of coals and coke frequently have to be made. Unfortunately, the chemist often is quite prevented by his routine tests from undertaking investigations which would be valuable to gas-works in general.

(To be continued.)

* See "JOURNAL," Vol. XLII., p. 18.

THE VALUE OF SULPHATE OF AMMONIA COMPARED WITH OTHER MANURES.

It will be in the recollection of many of our readers that, in the course of the Presidential Address of Mr. Alex. Bell to the North British Association of Gas Managers in July last, he referred to the interesting experiments with various manures which have been conducted for some time past at Lord Rosebery's experimental station at Dalmeny; and during the past week, our attention has been called by Mr. W. G. Blagden, the Chairman of the Sulphate of Ammonia Makers' Committee, to a report in the "North British Agriculturist" of a visit to Dalmeny of a number of gentlemen interested in agricultural science and practice, for the purpose of hearing and discussing the details of the experiments on the estate during the past year. Among others present were Mr. Drysdale, Lord Rosebery's factor; Mr. John Clay, the Royal Agricultural Commissioner, and Mr. John Hunter, F.I.C., F.C.S., who is entrusted with the supervision of the experiments. The past season was the second in which this important series of agricultural experiments had been carried out on the experimental grounds at Dalmeny; and so striking, as well as conclusive, were the results obtained on the duplicated plots, that last year the system of manuring which was found to give the best results was followed out on the whole of Lord Rosebery's farms with marked success. The soil on the experimental grounds is a fairly fertile loam; and in 1895 it had received a dressing of 30 tons of farmyard manure per acre. Mr. Drysdale explained to his visitors that these experimental grounds were being worked on a regular farm course rotation, just like any ordinary farm. On each of the four "breaks" sixteen different manures, or mixtures of manures, were being applied year after year, for the purposes of comparison as regards yield and quality of crop. Each plot was duplicated on an adjoining plot; so that the one should act as a complete check upon the other. In addition to the ordinary four-course rotation experiments, there were plots for testing the most productive varieties of potatoes and a duplicate series of experiments designed to test the best, method of combating the finger-and-toe pest. Beet cultivation had also been experimented on, in order to test the relative values of sulphate of ammonia and nitrate of soda in the production of sugar beet.

The party were afforded an opportunity of discussing some tabulated statements drawn up by Mr. Drysdale, showing the results of the experiments in the past year. He invited the attention of his visitors to the manurial mixtures which had given the most profitable results. In the various experiments, the superphosphate used was mineral supers, testing from 35 to 37 per cwt. soluble phosphate, and costing 55s. per ton. The farmyard manure used was well rotted dung made by cake-fed cattle in the courts. In the hay experiments, which had been conducted on an extensive scale on the farm, each plot being ¼ acre in size, he had reckoned the value of the first crop hay at 70s. per ton, and second crop hay at 60s. per ton. The mixtures which gave the best results in the hay experiments were, in the order of profits—

(1) 1 cwt. super and 2 cwt. of sulphate of ammonia, costing 18s. 9d. in all. Weight of the first cutting, 3 tons; weight of second cutting, 1 ton 4¾ cwt. The net profit of using this mixture, as compared with the unmanured plots, was £1 11s.

(2) 1 cwt. super and 2 cwt. of nitrate of soda, costing 18s. 9d. in all. Weight of first cutting, 2 tons 18 cwt. 3½ qrs.; weight of second cutting,

1 ton 5½ cwt. The net profit of using this mixture, as compared with an unmanured plot, was £1 9s. 4d.

(3) 1 cwt. super, 2 cwt. of kainit, and 2 cwt. of sulphate of ammonia, costing £1 2s. 6d. Weight of first cutting, 3 tons; weight of second cutting, 1 ton 4 cwt. 3 qrs. Net profit of using this mixture, £1 7s. 3d.

(4) 2 cwt. of sulphate of ammonia, costing 16s. Weight of first cutting, 2 tons 17 cwt.; weight of second cutting, 1 ton 6 cwt. Net profit of using this manure, £1 7s. 2d.

These comparisons of profits are made on the assumption that the hay produced was all of equal quality; whereas in reality the analysis in every case showed that the hay grown with sulphate of ammonia was immensely superior in percentage of albuminoid nitrogen to that grown with nitrate of soda.

In the potato experiments, the value of the tubers was reckoned as follows: "Ware," £3 10s. per ton; "seconds," £2 10s.; "smalls," £1 per ton. In these experiments, the plots which gave the best returns, in the order of profits, were—

(1) 4 cwt. super, 6 cwt. of lime compost, and 2 cwt. of sulphate of ammonia, costing £1 10s. per acre. Weight of crop: "Ware," 9 tons 7 cwt. 1 qr.; "seconds," 4 tons 4¼ cwt.; "smalls," 18 cwt. Net profit of using this mixture, as compared with unmanured plot, £13 16s. 11d.

(2) 4 cwt. super, 3 cwt. of sulphate of potash, 6 cwt. of lime compost, and 2 cwt. of sulphate of ammonia, costing £2 3s. 6d. per acre. Weight of crop: "Ware," 9 tons 16 cwt. 1 qr.; "seconds," 2 tons 14 cwt.; "smalls," 8 cwt. Net profit of using this mixture, £10 10s. 7d.

(3) Dung, 10 tons, reckoned as costing 10s. per ton, and two-fifths of said crop charged against first crop. Weight of crop: "Ware," 7 tons 15 cwt. 1 qr.; "seconds," 4 tons 3 cwt. 3 qrs.; "smalls," 1 ton 1 cwt. Net profit of using dung, as compared with unmanured plot, £7 16s. 4d.

(4) 4 cwt. super, 2 cwt. of muriate of potash, 6 cwt. of lime compost, and 2 cwt. of sulphate of ammonia, costing £2 8s. in all. Weight of crop: "Ware," 8 tons 16¼ cwt.; "seconds," 2 tons 19 cwt. 2 qrs.; "smalls," 11¾ cwt. Net profit of using this mixture, £7 11s. 6d.

In every case the sulphate of ammonia gave better results than the nitrate of soda. The plot adjoining that which gave the best return was manured with 4 cwt. super and 2 cwt. of nitrate of soda. On this plot the yield of "ware" was 7 tons 2 cwt. 1 qr., as against 6 tons 12 cwt. yielded by the unmanured plot; and the profit of using this mixture was only £1 17s. per acre. The results exactly confirm those of last year's experiments, and show: (1) That potash salts are not required for the potato crop where the land is in good condition through dunging; (2) that sulphate of ammonia gives better results than nitrate of soda; and (3) that dunging is a costly method of manuring as applied against a single crop, but that it is most important in the way of maintaining the fertility of the soil.

In the turnip experiments, the value of the bulbs was reckoned at 10s. per ton. In these experiments, the plots which gave the best returns, in the order of profits, were—

(1) 4 cwt. super, 6 cwt. of lime compost, and 1 cwt. of sulphate of ammonia, costing £1 2s. per acre. Weight of crop: 31 tons 7¾ cwt. dressed bulbs. Net profit of using this mixture, as compared with unmanured plot, £2 7s. 9d. per acre.

(2) 4 cwt. super, 1½ cwt. of sulphate of potash, 6 cwt. of lime compost, and 1 cwt. of sulphate of ammonia, costing £1 8s. 9d. per acre. Weight of crop: 31 tons 15½ cwt. dressed bulbs. Net profit of using this mixture, £2 4s. 11d.

(3) 4 cwt. super, 4 cwt. of kainit, and 1 cwt. of nitrate of soda, costing £1 6s. 6d. per acre. Weight of crop: 30 tons 4½ cwt. Net profit of using this mixture, £1 11s. 8d.

(4) 4 cwt. super and 1 cwt. of nitrate of soda, costing 19s. per acre. Weight of crop: 29 tons 9 cwt. dressed bulbs. Net profit of using this mixture, £1 11s. 5d. per acre.

The plot manured with 20 tons of best farmyard manure yielded a crop of 31 tons 15½ cwt. dressed bulbs; this being precisely the weight of crop yielded by the plot manured with 4 cwt. super, 1½ cwt. of sulphate of potash, 6 cwt. of lime compost, and 1 cwt. of sulphate of ammonia, at a total cost of £1 8s. 9d. As in the case of the potatoes, the results of these experiments exactly confirm those of last year, and show that for land in good condition the most profitable manuring is a mixture of superphosphate, lime compost, and sulphate of ammonia. Where land has been kept in good heart by means of farmyard manure, potash salts are not required. In every case, too, the analysis of the turnips showed that those grown with lime compost and sulphate of ammonia were much superior in albuminoid nitrogen to those grown with nitrate of soda.

In the experiments on the manuring of oats, there was a close pull for supremacy between the sulphate of ammonia mixture and the nitrate of soda mixture as regards the weight of crop. The nitrate mixture plot was badly lodged, whereas the sulphate of ammonia plot was standing erect at reaping time; and on this account it would be obviously incorrect to value the poorly ripened grain on the nitrate plot at the same rate as the well-ripened grain on the sulphate of ammonia plot. In one case only, throughout the whole experiments, did the nitrate of soda show better results as regards bulk of crop than the sulphate of ammonia; and, as already noted, in that case the grain had been lodged, and had not ripened well, so that it was inferior in quality. Apart from this particular case, the best results were obtained from the plot manured with 3 cwt. super, 6 cwt. of lime compost, 2 cwt. of kainit, and 1 cwt. of sulphate of ammonia, costing £1 3s. in all. The yield of grain on this plot was 8½ qrs., weighing 44¾ lbs. per bushel; and the net profit of using this mixture was £3 8s. 6d. per acre.

After the tabulated statements had been fully examined and compared by the visitors, Mr. Hunter spoke at some length in regard to the scientific aspects of the different experiments. Mr. Drysdale also remarked that both he and Mr. Hunter had taken a very deep interest in this work; and he could testify that the experiments had already more than repaid all the outlay and labour expended upon them. The experiments had shown what were the most profitable manures to use in order to obtain not only quantity but quality of crop; and in this way they had proved a good investment.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Use of Breeze as Boiler Fuel.

Sir,—For the last ten years we have been using breeze for boiler fuel, at several of our works, by means of Meldrum blowers. We can raise steam from what is a refuse article; and there is, as far as years of experience can ascertain, no damage whatever to plates. The flues, however, must be attended to pretty frequently, as the blast carries much fine dust into the flue channels. This is the only drawback.

Copenhagen, Jan. 27, 1898. F. D. Marshall.

Gas Testing in London.

Sir,—That interesting document which the Gas Referees are pleased to call the "Notification to the Gas Examiners" (formerly denominated "Instructions") made its usual half-yearly appearance in September last, only varied in the dull monotony of those that have preceded it for more than a quarter of a century by the supplementary statement that extensive changes would shortly be made in the testing of gas in London. After reading this important official announcement it was to be hoped that the much debated and still unsettled question of gas testing was at once to be placed on a footing that would be satisfactory alike to the Gas Companies and the public.

I was, of course, not unaware that the officials of the Board of Trade, like "the mills of the gods," grind slowly; but after the rough—not to say rude—shaking their arrangements for testing have received at the hands of the late Superintending Gas Examiner to the London County Council, it was hoped that, like Rip Van Winkle, they had at last awoke from their prolonged sleep. Up to the present, however, nothing appears to have been done by the Referees, except that a very pretty drawing of the "ten-candle pentane standard of light" appeared in the "Journal," which you facetiously told us would enable the Gas Examiner to "throw away the candles, candle-balance, 40-grain weights, shot, &c., and thus add at least ten years to his life." It would be a great boon, no doubt, to have this pleasant forecast realized.

The ten-candle pentane standard appears to be the joint production of the Gas Referees, with Mr. W. J. Dibdin and Mr. John Methven thrown in as a makeweight—presumably as a sop to Spring Gardens and the Gas Companies. When it is considered that this new standard of light has taken the Gas Referees close upon thirty years to produce, and cost the gas consumers of London something approaching £60,000 in salaries and expenses, it ought to be a very valuable article indeed, and for ever settle the question. This large amount of money does not include the expenses of the Committee that professed to deal with the standards of light three years ago. It is not difficult to get at the objects of this costly research. They appear to have been three. One was to get rid of the much-abused sperm candle; another, to gratify an old fad of one of the Referees; and the third I hope to refer to at another time.

It is rumoured that the new standard in the hands of at least some operators is quite as unreliable as the candle, and that variations of at least from 1 to 1½ candles have been found; and there are those who believe that, if it should become a substitute for the present standard, it would be less satisfactory.

The Committee to which I have referred was a mistake, inasmuch as it had no power to settle anything, and only served to show the incompetency of the Gas Referees to deal with the question. When the fact is taken into consideration that this department of the Board of Trade has been in existence for nearly thirty years, and that during that time, with unlimited means at their disposal, they have not been able to devise a substitute for the "uncertain candle," one is struck with amazement; still more so when it is found that they need the assistance of a hybrid Committee to help them out of their supposed difficulty. In submitting the new pentane standard of light, evidently they were either not sure of their ground, or were afraid of opposition from the Gas Companies. They are at liberty to accept one or the other horn of this dilemma.

I have before stated that, since their first appointment, the Gas Referees have done absolutely nothing. Here, however, I am wrong. In my haste, I had forgotten that they gave to the world that wonderful instrument "The Gas Referees' Pressure-Gauge," that will remain with us a lasting monument of their genius.

After the sweeping condemnation of the present system of gas testing made by Mr. W. J. Dibdin in his report to the London County Council, and the endorsement of that condemnation by the Chairman of the Council, at the last annual meeting of that body, it would have been only seemly for the Gas Referees to have made a reply defending their own work and justifying their existence; especially as they and their testing-stations have cost the public nearly £500,000. And now, forsooth, we are told by the London County Council that this money has been entirely wasted; that the present 23 stations furnish no protection to the public at all; and that they would have been better protected by an instrument costing a £10 note.

Verily, the ways of the Board of Trade are hard to understand.

Jan. 27, 1898. Vincent Taylor.

A Correction.—Referring to the article on the Rew Carburetted Water-Gas Process which appeared last week, Mr. R. Forbes Carpenter points out that the heat of dissociation of water and that of combustion of carbon to carbon dioxide were wrongly stated. He makes the balance to be supplied by the incandescent coke to decompose two units of water 50,244 units, not 40,244 units as given.

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1898).

Opposition on Standing Orders.

On Saturday, the 22nd ult., the last day for depositing at the Private Bill Office memorials complaining of non-compliance with Standing Orders, there had been presented memorials in respect of the petitions for the Aberystwith Gas Bill, the Filey Water and Gas Bill, the Ilford Improvement Bill, and the Newhaven and Seaford Water Board Bill. The memorialists in the first case were the Aberystwith Corporation; and they failed to sustain their allegation before the Examiner. The other memorials have been under consideration. The whole of the remaining petitions for Bills in which our readers are concerned have not encountered opposition at their initial stage.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, Jan. 25.

(*Before Justices* DAY *and* LAWRANCE.)

Howland v. South Metropolitan Gas Company.

This was an appeal from a decision of Judge Addison, at the Greenwich County Court, on Oct. 29 last, awarding the plaintiff, a workman in the employ of the defendant Company, £60 damages for personal injuries.*

Mr. ATHERLEY JONES, Q.C., and Mr. COMPTON SMITH appeared for the defendants, who appealed on the grounds that there was no proof of negligence on the part of the Company, and that there was contributory negligence on the part of the plaintiff; Mr. MINTON SENHOUSE represented the plaintiff.

The plaintiff sustained an injury to his foot while employed in connection with a light railway laid down at the defendants' East Greenwich works for removing breeze from the retort-house to barges; and the negligence alleged was the neglect to provide proper brakes or "sprags" to the trucks running on the line, in consequence of which a truck passed over plaintiff's foot. It was contended for the Company that there was no evidence on which the learned Judge could have found negligence on their part. At the conclusion of the argument on their behalf, the hearing was adjourned.

Wednesday, Jan. 26.

When the case was resumed this morning,

Mr. SENHOUSE submitted that the Judge had ample evidence before him to justify his findings, and that the appeal ought to be dismissed.

Justice DAY said he had come to the conclusion that there was not any evidence of negligence on the part of the employers which caused the accident. All things necessary were provided; but the workmen, for reasons of their own, did not think fit to use them. The appeal must therefore be allowed. There would be judgment for the defendants, on the ground that there was no evidence of negligence on the part of the Company.

Justice LAWRANCE concurred.

Mr. SENHOUSE asked leave to appeal; but this was refused.

Mr. ATHERLEY JONES said the Company did not ask for costs.

On the following day, Mr. Senhouse applied to the Court of Appeal, and obtained leave to appeal from the decision recorded above.

Leaving Work without Notice.

About a fortnight ago, a number of summonses were issued against workmen employed by The Gaslight and Coke Company. The allegations were that the men had ceased work without notice, and thus maliciously broken their contracts of service, though knowing or having reasonable cause to believe "that the probable consequences of their so doing in combination with others would be to deprive inhabitants of the County of London, or part thereof, either wholly or to a great extent of their supply of gas." The cases were set down for hearing before Mr. Baggallay on Monday last week; but during the morning Mr. Humphreys, solicitor, stated that the men had returned to work, and the Company therefore did not desire to proceed with the summonses. Mr. Baggallay expressed his pleasure at hearing the Company's decision.

Another Dispute as to the Water Supply to Prescot by the Liverpool Corporation.

At the Liverpool County Court last Thursday, before his Honour Judge Collier, an action was brought by Mrs. Ann Welsby, of High Street, Prescot, to recover from the Liverpool Corporation £6 17s. 6d., the cost of a water-cistern, which she had put into her house. Mr. Collingwood Hope appeared for the plaintiff, and Mr. T. Swift for the Corporation. The case turned mainly upon the construction of sections 32 and 37 of the Liverpool Corporation Water-Works Act of 1866. The district in which the plaintiff's house is situated is at about the highest elevation within the area supplied by the Corporation; and the natural flow by gravitation from the Rivington reservoirs not being sufficient, a pumping-station had been constructed to supply the higher parts of Prescot. Up to recently, the pumping and the consequent supply of water were intermittent, and caused some dissatisfaction, which led to a local Committee taking up the matter, and bringing two test cases—the present case being one, and that of Brady and the Corporation the other (see *ante*, p. 181). In the present case, the plaintiff, acting under what she conceived to be the powers of the consumer under section 37 of the Act, called upon the Corporation to place a cistern in her house, at their cost. This was declined, whereupon she herself had a cistern fixed at the cost of £6 17s. 6d., which she now sought to recover. She submitted that the Corporation were bound to give a constant supply; and for this purpose to provide a cistern in all houses within the district built before the Act came into operation, and of a less rateable value than £13. Mr. Swift argued that the section was distinctly one for the protection of the Corporation; the object being to guard against the undue waste of water. If the Corporation chose to waive their right to require a cistern to be placed in a house, they could do so, without incurring any legal responsibility. He also submitted that otherwise, if all occupiers of houses of this class in the district could introduce cisterns, it would be a most serious burden on the Corporation. For twenty-one years of intermittent supply, there had been no complaint; and the Corporation could now at any time by continuous pumping, as they were doing, maintain a constant supply. Judgment was reserved.

* See "JOURNAL," Vol. LXX., p. 953.

The Stockport Water Company Fined for Causing a Nuisance by Smoke.

The Stockport Water Company were summoned before the Magistrates at the Wilmslow Petty Sessions last Tuesday, by Mr. John Royle, a property owner of Wilmslow, for causing a nuisance by allowing dense black smoke to issue from the chimney at the Wilmslow pumping-station on Nov. 16, 20, and 26 last. The Clerk to the District Council (Mr. Cobbett) stated that the chimney in question was not a high one, and was situated at the bottom of a hill. A number of houses were near the place; and whenever the wind was in certain directions, the smoke from the chimney was blown straight into the windows and gardens of the houses. The Company had been treated with the greatest forbearance; complaints having been constant for years. In 1894, the Local Authority caused a notice to be served on the Company to abate the nuisance; and last year a letter was written to them on behalf of the Council giving particulars of observations that had been made. Evidence was given as to the emission of black smoke from the chimney, and as to complaints having been made to the Nuisance Inspector. For the Company, Mr. Wharton stated that the chimney was in existence before Mr. Royle went to reside at his house. The nuisance was caused, not by the chimney, but by a bake-house and the houses in the lower part of the village. The Engineer of the Company (Mr. Molyneux) spoke of a test which had been made when the wind was blowing from a south-westerly direction; and it was found the smoke from the chimney passed over Mr. Royle's house. Witness was present, and saw that the smoke from a bakery and some houses was blown against Mr. Royle's premises. Two other witnesses also stated that they had tried to produce black smoke at the works, and had failed. Mr. Chisholme, an Inspector of the Smoke Abatement Association, asserted that he had watched the chimney, on various dates, unknown to those in charge of the pumping-station; and he had only detected light and brown smoke, excepting on one occasion, when there was an emission of black smoke for about 30 seconds. The magistrates were of opinion that a nuisance had been proved, and imposed a fine of 20s. and costs in each case. They further ordered the Company to pay £10 10s. to prosecutor to meet his costs.

Gas v. Oil as the Cause of Fire.—In the annual report of Commander Wells, R.N., the Chief Officer of the Metropolitan Fire Brigade, it is stated that there were 3500 fires in London last year, of which 168 are classed as serious. Loss of life occurred in 87 cases. Only one death was due to gas explosion; whereas 21 fatalities resulted from the use of mineral oil lamps.

The Drogheda Corporation and the Gas Company.—Negotiations are on foot for the transfer of the undertaking of the Drogheda Gas Company to the Corporation. At a meeting of a Committee of the Corporation recently held, it was decided to offer the Company £21,000 for their works. If the Company decline to sell, their Bill, an epitome of which was given in the "JOURNAL" for the 11th ult., will be opposed by the Corporation.

The Public Lighting of Worksop.—At the meeting of the Worksop Urban District Council on Monday evening last week, the minutes presented by the Paving and Lighting Committee set forth that the Worksop Gas Company had accepted the Council's offer to take over the control of all the public lamps, on condition that one meter should be placed to every seven lamps, to the satisfaction of the Manager. They asked for an intimation that the Council would be prepared to take over the incandescent lamps as from the 28th of January; and the Council were recommended to agree to this and to arrange with the Company for a new contract, the price of gas to be 3s. per 1000 cubic feet, and the terms to be arranged by the Committee. Mr. Ilett, in moving the adoption of the minutes, said the Council had managed to get a reduction of 2d. per 1000 cubic feet on the price they had usually paid. He thought the new arrangements they were making with regard to the meters would tend to the better lighting of the town, and, so far as he could see, to a reduction of the lighting rate. The minutes were passed.

Hartlepool Gas and Water Company.—A special meeting of the Hartlepool Gas and Water Company was held last Thursday, for the purpose of considering the Bill which the Directors have introduced into Parliament. Mr. W. H. Fisher, who presided, said further powers were necessary in consequence of the increasing demand for water. Two new sites had been secured—one at Crooksfoot Gill and the other at Dalton Piercy. The Crooksfoot gathering-ground was 1340 acres in extent, and capable of yielding in ordinary seasons 670,000 gallons per day, or in dry seasons 376,000 gallons. The size of the gathering-ground at Dalton Piercy was 1728 acres; and this was capable of yielding in ordinary seasons 700,000 gallons per day, or in dry seasons 430,000 gallons. Last year the water supplied for all purposes was 1102 million gallons, as against 728 millions in 1889. The Crooksfoot reservoir would hold 200 million gallons, and that at Dalton 65 millions; but at present it was only intended to construct the former with a holding capacity of 100 millions. At a rough estimate, the work at Crooksfoot would cost £50,000, and at Dalton Piercy £35,000. After discussion, the Bill was approved.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Accounts.

In the "JOURNAL" last week we gave the report which the Directors of the Company will present at the ordinary general meeting next Friday. We now reproduce the principal items in the accounts for the six months ending Dec. 31, which accompanied it.

The capital account shows receipts (with premiums, £1,582,800) to the amount of £13,105,800. The expenditure is shown in the following items:—

Expenditure to June 30, 1897			£12,150,183 18 6
Expenditure during the half year to Dec. 31, 1897, viz.:—			
Lands acquired, including law charges	166 19 0		
Buildings and machinery in extension of works	£115,655 0 9		
New and additional mains and service-pipes	37,294 18 2		
Do. do. meters	49,791 15 1		
Do. do. stoves	34,520 5 10		
		237,428 18 10	
		£12,387,612 17 4	
Balance of capital account		718,187 2 8	
		£13,105,800 0 0	

The revenue and net revenue accounts are given in full below.

The balance applicable for division is £377,003 5s. 3d.; and the statement showing how the Directors propose to appropriate it is as follows:—

Dec., 1896.			
£108,898	..	Net balance brought from last account	..
309,036	..	Net revenue for the half year	302,483 16 9
..	..	Amount to be withdrawn from the reserve fund	74,519 8 6
£417,934			£377,003 5 3
(12½ per cent.)		A dividend on the ordinary stock—	
£372,186	..	12½ per cent. per annum on £5,922,110	377,003 5 3
£45,748	..	Balance carried to next account	..

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on Dec. 31 were as follows: Reserve fund, £123,002; insurance fund, £80,877; depreciation fund, £48,852. The insurance fund had to bear in the past half year a small payment of £7 16s. 4d. in respect of claims arising out of the explosion of gas in New Church Court, Strand, on Oct. 29, 1895; and a sum of £688, the value of plant destroyed by fires in the Company's district.

The statements furnishing particulars as to working are as follows:—

STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, 30th June, 1897.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 31st Dec., 1897.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	142,294	1,098,000	1,024,454	1,792	234,048
Cannel	23,852	12,182	*13,169	..	22,865
Total	166,146	1,110,182	*1,017,623	1,792	256,913

* In addition to this quantity, oil and spirit, the equivalent of 40,553 tons of cannel were used during the half year.

STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 30th June, 1897.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, 31st Dec., 1897.
Coke—tons	123,697	629,556	132,654	558,153	62,446
Breeze—tons	5,900	66,694	27,766	37,371	7,457
Tar—gallons	645,421	10,688,134	10,272,288	20,312	1,040,955
Ammoniacal liquor—butts	21,055	288,270	282,811	5,930	20,584

STATEMENT OF GAS MADE, SOLD, ETC.

Quantity Made.	Quantity Sold.		Total Quantity accounted for.	Number of Public Lamps.
	Public Lights and under Contracts (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*11,139,074	548,803	9,935,487	10,626,688	52,428
†10,943,772	540,424	9,722,610	10,412,938	52,154

* Including 837,068,000 cubic feet of "oil gas."
† December half year, 1896.

The last statement is the general balance-sheet. It shows that the value of the stores on hand on Dec. 31 was as follows: Coals, £148,074; coke, £25,330; tar and ammoniacal liquor and products, £124,654; sundries, £242,533—total, £540,591. The figures at the corresponding period of 1896 were: Coals, £145,164; coke, £57,875; tar, &c., £251,787; sundries, £241,112—total, £695,938. The item "automatic meter supplies (fittings account)" amounts to £281,445, as compared with £216,211 in the six months ending Dec. 31, 1896.

REVENUE ACCOUNT.

Dr. December Half Year, 1896.		£ s. d.	£ s. d.	Cr. December Half Year, 1896.		£ s. d.	£ s. d.
	To Manufacture of Gas—			£1,364,325	By Sale of Gas— Common gas, per meter, at 2s. 10d. and 2s. 3d. per 1000 cubic feet	1,393,868 13 11	
£579,269	Coals, including oil, dues, carriage, unloading and trimming	596,433 5 11		77,157	Public lighting and under contracts— Common gas	77,588 7 1	
18,448	Salaries of engineers and other officers at works	13,871 3 6		£1,441,482			1,471,457 1 0
164,039	Wages: Carbonizing £168,837/0/11	185,760 5 6					
16,287	Sundries £16,933/4/7			£12,416	Rental of stoves	..	14,222 5 2
31,502	Purification, including £17,149/8/7 for labour	33,473 11 8			Residual products—		
	Repair and maintenance of works and plant, materials and labour, less received for old materials,			£201 905	Coke, less £48,083 14s. 8d. for labour, &c.	202,908 8 6	
157,012	£2310 13s. 1d.	152,758 10 4		3,528	Breeze, less £2084 16s. 0d. for ditto	3,763 17 6	
			982,296 16 11	70,958	Tar and tar products	49,296 12 7	
	Distribution of gas—			44,257	Ammoniacal liquor and sulphate of ammonia	57,395 15 9	
28,878	Salaries and wages of Officers (including Rental Clerks)	31,144 13 6		£320,648			313,354 14 4
44,755	Repair and maintenance of mains and service-pipes	47,488 19 2					
24,794	Repair and renewals of meters	25,483 6 1		£4,014	Rents receivable		4,846 16 7
25,161	Stove fixing, repairs, and renewals	28,857 11 0		229	Transfer fees		223 2 6
			132,921 9 9				
17,539	Public lamps— Lighting and repairing	..	17,469 3 10				
	Rents, rates, and taxes—						
4,889	Rents payable	5,638 17 2					
111,831	Rates and taxes	110,334 8 10					
			115,973 6 0				
	Management—						
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors	200 0 0					
8,949	Salaries of Secretary, Accountant, and Clerks	9,513 16 10					
17,896	Collectors' commission	19,308 10 5					
6,639	Stationery and printing	7,031 3 8					
2,551	General charges	2,780 6 9					
			41,583 17 8				
21	Parliamentary charges	..	..				
2,055	Law charges	..	2,799 16 3				
5,037	Bad debts	..	5,814 7 8				
500	Depreciation fund for works on lease-hold lands	..	500 0 0				
13,413	Annuities	..	12,287 11 7				
	Public Officers—						
1,215	Gas Referees and Official Auditor	1,337 14 8					
793	Public testing-stations	691 9 1					
			2,029 3 9				
£1,281,873			1,313,174 13 5				
497,416	Balance carried to net revenue account		490,929 6 2				
£1,778,789			1,804,103 19 7	£1,778,789			1,804,103 19 7

NET REVENUE ACCOUNT.

Dr. December Half Year, 1896.		£ s. d.	£ s. d.	Cr. December Half Year, 1896.		£ s. d.	£ s. d.
	To Interest on debenture stocks and bonds, accrued to Dec. 31, 1897	..	63,058 13 9	£474,711	By Balance from last account	366,552 18 1	
74,015	Dividend on the preference stocks	74,022 5 0		..	Amount withdrawn from reserve fund	9,354 14 2	
							375,907 12 3
47,500	Dividend on the maximum stocks	47,500 0 0			Less dividend on the ordinary capital for the half year to June 30, 1897	..	375,907 12 3
			121,522 5 0	365,813			
4,205	Interest on temporary loans & sundry funds, less credits	3,884 10 8		£108,898			
417,934	Balance applicable to dividend on the ordinary stock	302,483 16 9		497,416	Revenue account	..	490,929 6 2
£606,314			490,929 6 2	£606,314			490,929 6 2

BIRMINGHAM CORPORATION GAS-WORKS.

Large Extension Scheme.

An important scheme of gas-works extension is dealt with in a report which the Birmingham Corporation Gas Committee will submit to the Council to-day, and which contains matter that will be perused with interest by gas engineers and managers generally.

In the first place, the Committee mention that they have accepted the following tenders in connection with extensions at Saltley, now in progress: Messrs. C. & W. Walker, new gasholder, £38,000; Messrs. Piggott and Co., ironwork for frame of ditto, £815; and Messrs. Westwood and Wrights, telescoping gasholder, £15,500.

On the wider subject of extension of works, the Committee state that they have given prolonged and careful consideration to the necessity which has arisen for the provision of additional manufacturing plant. At the outset of their inquiries, it became apparent that the provision to be made should not only be sufficient to provide for the estimated growth of the consumption in the next six years, but also to permit the speedy reconstruction of those portions of the present plant which have become obsolete. The cost of carbonization in the older retort-houses is now excessive, both by the increased cost of labour, and because the width of the houses is insufficient to admit of the use of charging machinery in them. The present value of the plant is about £60,000. The cost of labour in the retort-houses is from about 1½d. to 2d. per 1000 cubic feet in excess of that in the machine-charged houses. The Committee have based their calculations of the plant required to meet the increased output on an estimated annual increase of the consumption at the rate of 4 per cent. The rate of increase in the last twenty years has averaged about 4½ per cent. compound; but this increase has not been one of steady progress from year to year. In computing the requirements of the undertaking, it is necessary to make the calculations on the maximum weekly output to be provided for. This from the three works reached 156½ million cubic feet in 1896; and, notwithstanding the milder weather at the close of 1897, and some diminution of trade, this output has been very nearly maintained in the present year—the highest weekly output recorded this year having been 152 million cubic feet. In the last twelve years, the average annual increase in the maximum weekly output has been over 4½ per cent. compound; but in three of the years included in that period, the increase has been above 12 per cent., 12 per cent., and 18 per cent. respectively. In the opinion of the Committee, there is nothing to suggest that it will not be necessary to make provision in the immediate future for an increased sale, or to guard against the consequences of failure to meet such a demand.

The following figures are submitted in illustration of the effect of the competition of electric lighting on the consumption of gas. The total sale of electricity in Birmingham in 1896 was not more than equivalent to a sale of 60 million cubic feet of gas as ordinarily used for lighting purposes. This would not, even if it had all been used in substitution for gas, displace plant for the production of more than 350,000 cubic feet of gas per diem. The electric lighting of the Market Hall has only diminished the consumption of gas registered in that building from 8,600,000 to 6,900,000 cubic feet per annum. The greatest daily output of gas in Birmingham in 1896 was over 33 million cubic feet; and the total sale in the year was 4859 million cubic feet. In Manchester the sale of gas in that year was nearly 4200 million cubic feet; and the Gas Committee of that city estimated that gas had been displaced by electricity in the year to the extent of 185 million cubic feet. The increase in the sale of gas in Manchester in that year was, nevertheless, 420 million cubic feet. The effect of this competition in the Market Hall Ward in Birmingham, where electricity has met with the largest sale, and where it has had the advantage of the supply of large public and other buildings, is shown in the following table:—

	1892. Cub. Ft. Thousands.		1895. Cub. Ft. Thousands.	Dec. Per Cent.	1897. Cub. Ft. Thousands	Inc. over 1896 Per Cent.
Sale of gas in Market Hall Ward, central electric lighting area	351,592	..	315,995	.. 10·1 ..	327,282	.. 3·6
Sale of gas in Market Hall Ward, remainder of ward . . .	168,562	..	157,225	.. 6·8 ..	178,652	.. 13·6

In some of the other large cities and towns of the kingdom in which the sale of electricity has made considerable progress, the increase in the gas supply has been as follows:—

	Inc. Per Cent.			Inc. Per Cent.
Glasgow, 1889 to 1893 (about). .	30 00	..	1893 to 1897 ..	21·1
Manchester ditto . . .	16·94	..	ditto ..	15·07
Sheffield, 1890 to 1893	2·50	..	1893 to 1896 ..	16·70
Leicester, 1892 to 1894	2·17	..	1894 to 1896 ..	11·00

The Committee submit that, even if it seemed to be possible that within the next few years the substitution of gas for steam for motive power would cease, and the sale for lighting purposes would diminish, there would be still no justification for neglecting the experience of the past, and no escape from the duty of the Council to guard meanwhile against the risk of not being provided for other conditions. The most simple and inexpensive method of providing for such necessities would no doubt be the development of the water-gas plant. But the Committee, without further experience of it, are not prepared to recommend any extension of its supply beyond one-fourth of the total output. The construction of the additional plant required should, they say, be begun early in the present year, so as to be available by the winter of 1899, when it is estimated the maximum output of the whole of the present works, both new and old, with only a slight margin for reserve, will be reached.

The Committee therefore recommend that they be authorized to undertake, at an estimated cost of £366,000, the construction on the Nechells land of a retort-house and condensing plant, for the production of 5 million cubic feet of coal gas per diem; on the Devon Street land, the additional purification and other plant required in connection with it; the construction of an additional retort-house, at Windsor Street, for a production of about 1½ million cubic feet per diem, with a proportionate extension of water-gas plant, at both places; the reconstruction of the old retort-houses Nos. 2 and 3, at Saltley, and of those at Windsor Street, and the provision there of the additional purifying and other plant, for the further increased output of about 3¾ million cubic feet per diem, which will then be obtained. Of this expenditure about £23,000 will be chargeable to revenue in respect of retort-houses to be taken down. This proposed expenditure is based on the adoption of inclined retorts for the coal-gas plant. If it should be found before the work is begun that it is for any reason desirable to adopt horizontal retorts, the estimates would be increased by about £10,000 on capital account. The estimates do not provide for the retort-settings (which would be charged to revenue in the ordinary way), the cost of railway connections, nor for any expenditure in diverting the main sewer across the Devon Street land, or in re-forming the channel of the River Rea, both of which, if not necessary, may be desirable, and as to which the Committee are now in correspondence with the Public Works Committee. The capital expenditure now proposed will, it is estimated, be required as follows: 1898, £55,000; 1899, £68,000; 1900, £113,500; 1901, £99,500; 1902, £30,000—total, £366,000. The Committee add that they have been anxious, while not losing sight of the most economical development of the resources of the department, to submit a plan, which, being complete for its purpose, should involve the least possible capital expenditure. They are of opinion that the proposals now made have been reduced as far as is consistent with safety, and strongly recommend them for adoption.

THE NORWICH CORPORATION AND THE BRITISH GASLIGHT COMPANY.

The Interest on Working Capital—Quality of the Gas.

In the "JOURNAL" last week, reference was made to a report presented to the Norwich Town Council, at their meeting on the 18th ult., by the Executive Committee, in regard to the British Gaslight Company; the two matters specially dealt with being the charge for interest on working capital and the quality of the gas.

The Committee began by pointing out that the Gas-Works Clauses Act, 1847, provides that when the reserve fund of the Company amounts to one-tenth of the annual capital, the surplus profits, after paying interest and dividends, are to be applied rateably in reduction of the price of gas. Before this section can operate, upwards of £22,000 must be paid into the fund from the profits. No sum stood to the credit of the reserve fund at the half year ending the 30th of June last. On that day the profit and loss account was overdrawn to the extent of £8286; this sum having been paid in making up the deficiency in previous years of the dividends authorized by the Company's Acts. On comparing the accounts for the half year with those for the corresponding six months of 1896, it was found that the capital had been increased by £4676, while the business had decreased to the extent of 3,778,500 cubic feet of gas. But the coal carbonized was 1356 tons more than in 1896, the cost of it was £716 more, and the expenditure was £848 more; while the gas-rentals were reduced £641, the residuals produced £467 less, and the total revenue was £1041 less. After paying the dividends, there was a loss of £2892 upon the working of the Company in the half year ended June, 1897. The Committee express their gratification at being able to report that, in face of this loss, the Directors have such confidence in reducing the working expenses that they have lowered the price of gas 6d. per 1000 cubic feet, which is estimated to further reduce the income about £6000 per annum.

The report next gives some correspondence which had taken place between the Town Clerk (Mr. G. B. Kennett) and the Company's Secretary (Mr. H. B. Chamberlain) on the accounts for the first half of last year. The Auditor to the Corporation found in the general establishment expenses an item of £534 charged as the half-year's interest, at 7 per cent., on £15,276, and also that the estimated value of coal on Jan. 1, 1897, was deficient to the extent of £865, one-half of which sum had been written off in the half year. Explanation was asked for on these points—first, as to what item in the accounts was represented by the £15,276; and, secondly, how the deficiency in the coal was supposed to have arisen. Mr. Chamberlain explained that the charge of £534 was for interest on working capital advanced by the parent Company, the amount of which was arrived at by taking 7 per cent. on the sum actually expended on the works—viz., £218,229—as authorized by the Act of 1875. With regard to the deficiency in the coal, this arose from the Manager over-estimating what he had in store. Upon the receipt of this explanation, the Town Clerk wrote to the effect that he could not find in the Act of 1875 sanction for charging 7 per cent. interest upon any sum beyond the £80,000 therein authorized to be laid out; and he asked to be referred to the authority for "charging interest at 7 per cent. upon 7 per cent. of the sums expended on works." Thereupon the Secretary pointed out that it was absolutely essential that the Company should have working capital at their Norwich station, as obviously they could not carry on their business without it. No special provision was made by their Acts for such capital; and they were therefore compelled to supply it out of their general funds. As to the amount on which interest was charged, this was calculated in the manner previously explained, because 7 per cent. of the money expended on the works was considered by the Directors to be a fair estimate of the working capital employed. The amount had been found, as a matter of fact, to be very much larger. On consideration, however, the Directors thought that a mistake had been made in charging 7 per cent. interest, and that 5 per cent. should have been the figure. This would be corrected in the accounts for the half year ending Dec. 31, and credit given for the difference. Dealing with this matter, the Committee say the Company appear to have obtained from their Norwich station since 1875 various sums as interest, under the title of general establishment charges, amounting to £16,681, or thereabouts. Similar charges were, they remark, probably made by the parent Company against the Norwich station before that date—in fact, since 1858. The Committee have been unable to find any authority for the charging of interest upon capital beyond the sums authorized to be borrowed by the Company's Special Acts. They recommend that the Company be called upon to repay to the credit of the reserve fund of the Norwich station all moneys that have been improperly charged to the station; and that the Law Committee should be instructed to take such action as they may be advised to enforce such repayment. The amount charged for interest

for the half year ending June 30 last was at the rate of £1068 6s. 6d. per annum. The sums which seem to the Committee to have been wrongly charged for interest would, they say, discharge the debt due to the parent Company and leave nearly £9000 in the reserve fund.

In the next portion of the report the Committee take up the subject of the illuminating power of the gas. They recite the conditions laid down by the Company's Act of 1896, as well as the obligation imposed upon them by their Act of 1858 to cause to be erected, at some "convenient place" within the city, an experimental meter with necessary apparatus for testing the illuminating power of the gas. The meter was placed at the laboratory of Mr. F. Sutton, about half a mile from the gas-works. This gentleman was appointed Gas Inspector under the 1858 Act on April 18, 1865; and subsequently Gas Examiner under the Gas-Works Clauses Act of 1871—his salary being paid by the Company. The Committee are of opinion that as the testing-station was located at the place above named with the approval of the Council, and has been continued there without objection for nearly forty years, there might be considerable difficulty in obtaining its removal to a more distant spot from the gas-works, though the expansion of the city seems to make it desirable. Until October last Mr. Sutton delivered to the Corporation monthly reports only of the average of his tests during the preceding month. On the 30th of September he was asked by the Committee to make at least one test daily, and to report the result on the day immediately following that on which the test had been made. Mr. Sutton now delivers his reports in accordance with the requirements of the Gas-Works Clauses Act, 1871; but as he is paid by the Company to make four tests only per week for illuminating power, and four tests only per month for sulphur and ammonia, the daily reports desired by the Committee are not yet made. The Committee find that, previous to the opposition to the Company's Bill of 1896, tests were not made by Mr. Sutton so often as they are now. In compliance with the request of the Law and Parliamentary Committee, the Directors of the Company agreed that additional tests should be made; and Mr. Sutton's salary was increased for these extra tests. The Executive Committee have not heard of any complaint against the quantity of either sulphur or ammonia in the gas; but in their opinion four tests a months are insufficient. The tests for sulphur, as reported by Mr. Sutton, show a large margin in favour of the Company upon the statutory limit.

In October last the Town Clerk, by instruction of the Executive Committee, wrote to the Secretary of the Company complaining of the "bad quality and insufficient illuminating power" of the gas supplied to the public lamps and the private consumers, and expressing the hope to receive an assurance that an improvement would be effected in this respect. To this letter Mr. Chamberlain replied to the effect that the Directors could not admit that the complaints were well founded, in the face of the results of the tests made by Mr. Sutton, which were confirmed by those of the Company's own officials. These tests showed conclusively that the gas supplied was of a particularly good quality; the illuminating power for the month of September averaging 15·6 candles, whereas the prescribed minimum was 15 candles, and the average of sulphur being 10·20 grains, as compared with the prescribed maximum of 25 grains. He said the Directors had always been desirous of fulfilling in the fullest manner their obligations to the consumers of gas in Norwich; and this had been evidenced by the records of quality for many years. Mr. Young, the Engineer recently appointed to the charge of the Norwich works, had been furnished with a copy of the letter, and requested to report thereupon to the Board after investigation, and after consultation with the City Engineer and City Analyst. He added that the complaints received at the gas-works from consumers were few in number, and did not support the suggestion of general bad supply. Since this correspondence took place, there has been an improvement in the illuminating power of the gas; and the Committee do not advise that any expense should be incurred in obtaining further tests at present. They wish to have authority, however, to incur any expenditure they may consider requisite for obtaining independent tests by specialists, or more frequent tests by the Gas Examiner, if they find any falling off in the light-giving quality of the gas.

As stated in the "JOURNAL" last week, the report has been adopted by the Council.

EDINBURGH AND LEITH GAS COMMISSION.

The Use of Carburetted Water Gas.

At the Meeting of the Edinburgh and Leith Gas Commission on Monday last week—Lord Provost MITCHELL THOMSON in the chair,

Bailie KINLOCH ANDERSON said there had been a meeting that day of the Works Committee, at which the subject of carburetted water gas, which was exciting the public mind to a little degree, was considered. Their Engineer, Mr. Herring, read a report upon it, which the Committee adopted. Mr. Herring had the report in his hand; and he would ask him to read it to the Commission.

Mr. Herring's report was to the following effect:—

I have to report that Messrs. Humphreys and Glasgow have now completed their contract for the carburetted water-gas plant, and have completed the sixty days' working of the same, which was part of the contract conditions. During this period one-half of the plant has been worked, and this intermittently, and excepting on two occasions not during the night shifts; careful tests being made from day to day, and at various times of the day, to ascertain the maximum and average percentages of the various gases added, and a careful note taken of the increased percentage of carbon monoxide contained in the gas at the time, full particulars of which are contained in a statement attached to this report, and a copy of which has been handed to the Town Clerk for the information of the Health Committee.

The result of these analyses show that the maximum increased percentage of carbon monoxide that was found in the gas at any time during this period, and for the maximum hour's work, was 5·25, on Jan. 8; the average increased percentage of the gas for that day being 3·45. The maximum and average increase for any given day was 4·25, on Dec. 23; this being one of the two occasions when the plant was working for 24 hours. The average increase for the whole period amounted to 2·36 per cent. As far as we have been able to prove it under the circumstances of intermittent working, the plant works up to its guaranteed conditions, both as regards capacity and the quantity of coke used. The working of the plant with the Scotch oil was not guaranteed; but the results obtained are satisfactory as compared with the use of Scotch oil in other works, but are not equal to the Russian or American oils. The question of labour is also approximately what was specified; but as we have not worked the plant for full days in succession, I have not been able to actually prove this. I have no doubt whatever we can accomplish the work with the number of men originally stipulated.

The Contractors having completed their contract, now ask the Commissioners to take it over; and, having satisfied myself that the same is satisfactory, I ask for your instructions in this matter, and for the payment of the balance due to the Contractors. I would also ask for your instructions as to the working of the plant in future.

As the plant has been worked solely to permit of the fulfilment of the contract conditions, I may say that there is no necessity for continuing the working of the same beyond a few hours a day to keep it in proper order. This will permit of the Health Committee of the Corporation completing the investigations which they have in hand. Furthermore, before we need bring the plant into full use, it is expected that Parliament will have had time to fully consider the matter in the interests of the public, as several English corporations are purposely raising the question in connection with the Private Bill Legislation of the ensuing session of Parliament; and I am informed that the matter is then to be very fully investigated and thrashed out. Doubtless, before we need put the plant into full operation, Parliament will have formulated regulations for its use, should the evidence to be laid before them warrant their interfering in the matter.

I have the fullest sympathy with the public in their desire to be assured as to the safety of the use of carburetted water gas when mixed with coal gas in the proportion proposed by the Commissioners—viz., 20 to 25 per cent. But I must say that they have been grossly misled on questions of fact, and as to the properties of the gas in question; and I do not for a moment wish it to be thought that I in any way support the random statements that have appeared in the "Correspondence" columns of the Press from time to time.

Carburetted water gas has the same smell, the same illuminating power, and practically the same heating power as coal gas. It is not destructive to fittings, and is less likely to leak, owing to its being heavier or more dense than coal gas. As to its alleged increased poisonous properties, no evidence can be brought forward to prove that the theorists are correct. Practical experience of the use of this gas in many British towns proves that they are entirely wrong. It has been in use for from two to eight years in the principal towns in England, as well as in Belfast; and there is no evidence to show that the public health has been prejudiced, or that there is any increased danger in its use.

Edinburgh itself gives further proof, if such were needed. Owing to the class of coal used in Scottish gas-works, the percentage of this particular gas is about three times greater than in the average English gas-works; and if the increase of the carbon monoxide in the gas supply makes it more dangerous, as it is alleged, where is the proof that accidents in the past have been three times greater in Edinburgh and other Scottish towns than in the average of English towns?

STATEMENT *showing the Increased Percentage of Carbon Monoxide in Gas Supply by reason of the Experimental Working of the Carburetted Water-Gas Plant by the Contractors.*

Date. 1897.	Average Increase in Day's Supply.	Average Increase at any Single Hour.	Date. 1897.	Average Increase in Day's Supply.	Average Increase at any Single Hour.
Nov. 20	0·19	0·52	Dec. 20	2·21	3 32
22	1 58	4·22	21	2·01	3·62
23	0·98	2·62	22	2·68	4·02
24	1·20	2·62	23	4·52	4·52
25	1·56	3·42	27	2·14	3·22
26	1 24	3·32	28	2·20	3·52
26	1·35	3 62	29	0·99	1·62
27	1·17	3·52	30	2·88	4·32
29	3·01	4 52	31	2·46	4·92
29	2·61	3 92	1898.		
30	2·18	4 02	Jan. 3	2·68	4·02
Dec. 1	1 81	2·72	4	3·16	5·02
1	2·88	4 32	5	2·32	3·72
2	2·28	3·42	6	3·48	5·22
3	2·71	4·12	7	3·48	5·22
6	1·45	2·32	8	3·45	5·52
8	2·21	3·32	10	3·35	5·02
8	2 41	3·62	11	2·88	4·32
9	2·41	3·62	12	3·41	5·12
10	2·88	4·32	13	3·72	3·72
11	2·48	3 72	14	2·39	3·82
13	1·48	2·22	15	1·51	2·42
14	1·94	2 92	17	2·89	4·62
15	1·81	2·72	18	3·61	5·42
16	2·28	3·42	19	2·75	4·12
17	2 48	3 72			
18	2·11	3 62	Average	2·36	3·73

Bailie KINLOCH ANDERSON moved the adoption of the report. The Committee recommended the taking over of the plant, and the payment of the balance due to Messrs. Humphreys and Glasgow, who had fulfilled their contract to the letter, and most certainly had proved every statement they made, as to the capacity of the plant, when they entered into the contract. Mr. Herring's report went on to ask instructions as to the future, and suggested that, as the pressure of the season was over, and there being available coal retorts, there was no necessity to continue it in the meantime, except for a few hours a day. Mr. Herring pointed out, very properly, that the whole question of the use of carburetted water gas would be under the consideration of Parliament, during the session which was about to open. It was anticipated that Parliament would lay down the maximum quantity of carbon monoxide which they would allow to be sent out. The Commissioners would have this before they again required to consider the matter. The public might rest assured that the Commissioners would not infringe the order of Parliament—in fact, he thought they would be much below the quantity allowed. But whether Parliament gave any order or not, the public might be sure that the Commissioners would do nothing which would be prejudicial to the public interests.

The report was adopted.

THE HULL CORPORATION AND THE KINGSTON-UPON-HULL GAS-WORKS.

Agreement with the British Company for the Supply of Gas in Bulk.

The arrangements for the purchase of the Kingston-upon-Hull Gas-Works by the Hull Corporation being now practically complete, the Gas Committee have been negotiating for the supply of gas in bulk to the district now served by those works, in order to further the scheme which the Corporation have set out for the improvement of the portion of the borough known as the Old Town. At the meeting of the Committee last Tuesday, the Town Clerk (Mr. E. Laverack) submitted a copy of a letter which he had sent to the Sutton and Southcoates Gas Company and the British Gaslight Company as to supplying gas to the consumers in the Old Town on behalf of the Corporation. The Sutton and Southcoates Company originally offered to supply at 1s. 6d. per 1000 cubic feet, but pressed a few weeks ago for a reply to their offer. The Committee, not having opened negotiations with the British Company, felt that the Council would probably ask for this to be done; and therefore decided to approach both Companies simultaneously, submitting certain conditions. Both replies were now laid before the Committee. The British Company offered to furnish gas in bulk at 1s. 6d. per 1000 cubic feet; but no price was mentioned by the Sutton and Southcoates Company. The British Company's present price to their ordinary customers is 1s. 10d. To their offer to supply the Corporation at 1s. 6d. is attached the condition that, should the price of coal rise, and the Company found it necessary to increase the rate to the ordinary consumers, the charge to the Corporation should also be increased; but that there should always be a difference of 4d. in the charges as between the Corporation and the ordinary consumers. They also make another condition, that if at any time they decided to lower the charge to the general public, then the rate to the Corporation should be reduced proportionately. The proposal of the Corporation is to charge the consumers 2s. 8d.; and the difference between this figure and the 1s. 6d. will be devoted to paying off the purchase money and to the relief of the rates. With neither condition could the Gas Committee disagree; and they therefore decided to close with the terms, subject to certain matters of detail being arranged. The decision will come up for confirmation at the meeting of the Council on Thursday. Subject, of course, to an arrangement satisfactory to the Corporation, steps will at once be taken for dismantling the Kingston-upon-Hull works; and, in the event of this being done, the projected street improvements will be materially helped forward.

GAS WORKERS' WAGES AND HOURS OF LABOUR AT STAFFORD.

At the last Monthly Meeting of the Stafford Town Council, the Gas and Electricity Committee brought up a report by a Sub-Committee on the subject of a memorial which had been presented requesting a revision of the gas workers' wages and hours of labour. The Sub-Committee had a conference with the representatives of the men, with the result that they made the following recommendations, to take effect as from the 1st inst.: (1) Stokers to draw and charge, on an average over three weeks, 30 mouthpieces per man, and to be paid 5s. per shift of eight hours. (2) Firemen to be paid 4s. 6d. per day, being an increase of 6d. (3) Wheelers' wages to be raised from 4s. to 4s. 3d. per shift of eight hours, and one wheeler to attend to two stokers. (4) Yardmen's wages to be raised from 21s. to 22s. per week of 54 hours, if the men are skilled and able-bodied workmen. (5) Sunday work for all men working upon eight-hour shifts, which includes the retort-house workmen, to be in future paid at the rate of time-and-a-quarter from 6 a.m. to 6 p.m. Yardmen and others working 54 hours per week to be paid at the rate of time-and-a-half for Sunday work, as at present. Sunday work to be abolished, as far as possible, from 6 a.m. to 10 p.m. (6) The following holidays to be granted and paid for each year to all employees: Christmas Day, Good Friday, Whit Monday, and August Bank Holiday; but if any of the retort-house men or gas-fitters prefer to have six days' consecutive holiday, in order to leave the town with their families, or make other arrangements satisfactory to the Manager, they may do so in lieu of the four days now allowed, and shall be paid six days' wages. The Chairman of the Committee (Alderman W. H. Peach), in proposing the adoption of the report, stated that the memorial contained requests with which the Committee, in the interests of the ratepayers, could not agree, and which, if granted, would have entailed an expenditure equal to more than 3d. in the pound on the rateable value. Certain alterations had, however, been made in the wages and conditions of some of the men. Mr. Hammond criticized the recommendations of the Sub-Committee, which had been stated by the Manager (Mr. J. Ferguson Bell, Assoc.M.Inst.C.E.) to be fair in comparison with other towns. He contended that the Sub-Committee had not sufficient details before them to enable them to come to such a generous conclusion as they might have done if their information had been greater. He set forth his objections at some length, and concluded by moving, as an amendment, that the matter should be referred back for re-consideration, as he looked upon the recommendations as unfavourable to the men. Mr. Blackman seconded the amendment. Alderman Peach said Mr. Hammond was present when the matter was discussed in committee, and he was surprised that he should have taken the course he had. With regard to the memorial, he would take the liberty of saying that it was not seen by the men before it was sent in. It was of the most outrageous character. The first paragraph practically asked that the management of the works should be taken out of the hands of the Committee entirely; and it went on to ask for more money, more holidays, less work, and someone to help the men to do it. He replied categorically to Mr. Hammond's criticisms; and concluded by assuring the Council that the Sub-Committee had considered the memorial, had dealt with it in an amicable spirit, and had made recommendations which meant an additional expenditure of £150 a year. On a division, the amendment was lost—only two voting for it. The report was adopted, with the word "competent" substituted for "skilled" in the fourth recommendation.

THE VIENNA GAS-WORKS LOAN.

It may now be safely stated that Dr. Lueger, the Burgomaster of Vienna, will get the 30,000,000 florins which he has been so long seeking to obtain in some of the principal capitals of Europe for the purpose of carrying out his scheme of gas supply in the city. All kinds of rumours have been afloat in reference to this now celebrated loan, one of which—to the effect that it would be taken up by a combination of Swiss and Paris financiers—we recorded last week. On Tuesday, the Frankfort Correspondent of the "Financial News" sent to that paper, which has devoted a considerable amount of attention to the subject, a report that the loan had been concluded with the Deutsche Bank; the price of issue to be 98, and the loan to bear interest at 4 per cent. In order to test the accuracy of the report, our contemporary telegraphed to the bank, and received a reply which dispelled all doubt. The announcement appeared on Wednesday under the somewhat American headline of "Germany Finds the Money for a Disgraceful Attack on British Capital." It was stated that the bank would take over the working of the Vienna Electric Tramway; but when the matter was before the Municipal Council on Tuesday evening, Dr. Lueger declared that he had not entered into any obligation in regard to the tramways, in which the bank and its associates are the principal shareholders, or with reference to the future electric tramways, which are to be built by the firm of Siemens and Halske, members of the Loan Syndicate. The correspondent of the "Standard" says the denial meets with general incredulity; and, though it may be formally correct, it is virtually a fact that, without making his peace with the owners of the tramways, and without promising that the town will not oppose the construction of electric lines and the gradual transformation of the existing horse tramways into electric ones, in Buda-Pesth, Dr. Lueger could not have obtained the loan on such favourable terms. Notwithstanding his denial, and his previously expressed intention of curtailing the privileges of the Tramway Company, which it is alleged does not adequately meet the requirements of Vienna, it is a fact that in two days the Company's shares went up about 18 florins.

At the meeting of the Municipal Council above referred to, the Burgomaster's statement consisted mainly of a recital of the fruitless efforts which had been made to obtain the loan; the negotiations with the Deutsche Bank having been broken off and again resumed. It must therefore have been with something of a triumphant air that he announced the eventual success of this portion of his anti-Semitic policy. But, curiously enough, on the very day this success was announced, he sustained a defeat which, according to the Vienna Correspondent of the "Standard," bodes ill for the future municipal gas-works—a lawsuit between the town and the Imperial Continental Gas Association having been decided at the first hearing in favour of the latter. It appears that the concession for the old districts of Vienna, with about a million inhabitants, will terminate on the 31st of October next; but the Association still hold concessions from the former suburbs now amalgamated with Vienna, which will not expire till between 1903 and 1917. They refer to 27 suburbs, with at least 500,000 inhabitants. The case for the City was that, as all these suburbs are now legally a part of Vienna, the different concessions expire together with the principal concession; while it was contended by the Association that Vienna inherited all the obligations entered into by the former suburbs, and is bound to observe them—a view adopted by the Vienna Court of Commerce. Should the appeal against this finding prove unsuccessful, the new gas-works erected to supply Greater Vienna will be excluded for a number of years from one-third of the town, and therefore will not be remunerative enough to pay the interest and sinking fund of the gas loan. In its outer districts, the Municipality would have mains which they could not use; and in the inner districts the Association would be in the same position. As Dr. Lueger stands or falls by his gas policy, the whole question is being keenly discussed in Vienna.

Reference has already been made to the interest taken in the Vienna gas question by the "Financial News." It may therefore be permissible to reproduce a leading article on the subject which appeared in that paper last Wednesday: "With amazement we learn that the Deutsche Bank has agreed to find for Dr. Lueger a loan of 30,000,000 florins with which to complete the Vienna municipal gas installation. Our surprise has a double foundation. It astonishes us that the Deutsche Bank should assist the Vienna Municipality in a palpably extravagant transaction; it astonishes us even more that the bank should find the sinews of war for what is virtually a campaign against capital. No doubt the Deutsche Bank has arranged this loan so as to facilitate another operation; but that does not affect the main point at issue. The admitted aim of Dr. Lueger in entering on the gas speculation was to 'turn the English out of Vienna;' and the Deutsche Bank has become his accomplice in furthering this choice object. The Imperial Continental Gas Association has lighted Vienna for more years than the Emperor Francis Joseph has reigned, and it has done its work without incurring serious criticism. Its concession in Vienna proper expires with the century; and in the ordinary course it was prepared to treat for a renewal, or to transfer its works and mains to the authorities, as it has done in the case of Amsterdam. The Association's entire plant, as we understand, might have been acquired by the Municipality for some 17,000,000 florins; the moderation of the price being due to recognition by the Company that some of the mains would soon require to be replaced by new ones of greater capacity. But Dr. Lueger was in no mood for dealing with the Association on a business basis. He was committed to an anti-Jewish crusade, and, perhaps impressed by the arguments of those who declare the English to be the lost Ten Tribes, he chose to confuse this English Company and its shareholders with the objects of his ridiculous campaign. So, rather than buy the Association's Vienna undertaking on favourable terms, he and his docile majority decided to build new gas-works and lay down an entirely new system of mains, at an outlay whose limits cannot yet be guessed. Though the concession of the Imperial Continental Gas Association for the inner city of Vienna soon runs out, it remains in possession of rights in the outer city and suburbs, and so will compete with the municipal gas-works. All the regular Courts in Austria declared that even in the inner city the Association might continue to do business on its own account after the expiry of the concession. But a special tribunal of a political nature was organized; and this Court arrived at the eccentric decision that no foreigner could have a right of property in

the subsoil of the capital city of Austria, and so the Company must perforce abandon the inner city. It need not be pointed out that, as the Association remains in the outer city and suburbs, the calculation that the Municipality will fall heir to a revenue as large as that hitherto drawn by the Company from Vienna is clearly absurd; yet this was one of the attractions offered when the gas loan was being hawked about in London. Whether or not the Deutsche Bank has accepted this view of the particular security behind the loan we do not know; and as the transaction has obviously not been entered into on its own merits, but probably as a makeweight in another of greater promise, it is possible that the bank did not scan the security too closely. To give 98 for a Viennese 4 per cent. currency loan, based on an enterprise partly competitive and tainted with partisanship, does not look like business. If the interest is not payable at a fixed rate of exchange, the surprise at the temerity of the Deutsche Bank will be increased; for the stability of the Austrian exchange—never in a state of secure equilibrium—is gravely threatened by the necessity for large grain imports to cover the deficiency in the harvest. No English house would take a hand in such a transaction; and it will be remarkable if the Deutsche Bank succeeds in placing the loan among its clients at an advance on 98 per cent. Even if the 30,000,000 florins sufficed to cover the cost of the gas installation, it would be a bad bargain to pay so much for what might have been obtained for little more than half of that sum. It is quite impossible for Englishmen to shut their eyes to the unfriendly nature of the action of the Deutsche Bank. Finance is essentially cosmopolitan; but that a German bank which draws profits and prestige from its London connections should assist in a policy of extermination aimed at an irreproachable English Company, seems a breach of the *entente* that should subsist among capitalists. This is not legitimate competition, nor a battle of wits and energy for supremacy in an open field. Dr. Lueger has made no secret of his enmity to English capital in Vienna; and the Deutsche Bank cannot be in ignorance of his sentiments. Fortunately, the Imperial Continental Gas Association, with its magnificent business in many other towns, its reserve of £400,000 in Consols, its invested depreciation fund of £1,000,000, and the £1,750,000 in cash to be received for its Amsterdam undertaking, is in a position of too great strength to be seriously injured by the loss of the Vienna concession; but that does not affect the principle at stake. The Deutsche Bank has rallied to Dr. Lueger's cry of 'No English in Vienna!' More serious from the point of view of the bank's own *clientèle* is the fact that it has ranged itself on the side of an anti-capitalist movement. That a financial establishment of standing in any country should furnish the sinews of war for a campaign of this nature is odd indeed; and we cannot congratulate the Deutsche Bank on its new departure. We wish it joy of its bargain—a loan rejected in London and elsewhere, as presenting no attractions to investors; and we shall look with curiosity for an attempt to issue it publicly in Germany. A foreign loan made to supply the means of expelling international capital from Vienna cannot commend itself to a logical people."

IMPORTANT SALE OF GAS AND WATER STOCKS AND SHARES.

At the Auction Mart, Tokenhouse Yard, on Tuesday last, Mr. Alfred Richards conducted an important sale of gas and water stocks. The first lots submitted consisted of a new issue of "C" stock by order of the Directors of the Tottenham and Edmonton Gas Company, carrying a dividend of 9 per cent. The amount offered was £5260; and it realized an average of £223 17s. 10d. per £100 of stock—yielding the purchaser £4 0s. 4d. per cent. on his investment. Following this came a new issue of £10 shares in the Lowestoft Water and Gas Company, bearing 5¼ per cent. dividend. They were knocked down at an average of £15 3s. 2d. each; returning the purchaser £3 9s. 3d. per cent. Some stock of the Taunton Gas Company was next put up. "A" stock, on which 8 per cent. is being paid, fetched, on an average, £196 18s. per £100, returning £4 1s. 3d. per cent.; ordinary stock (7 per cent.), £174 16s., returning £4 0s. 1d. per cent.; and £5 "yellow" shares (7 per cent.), £8 10s. each, returning £4 2s. 4d. per cent. Three other new issues followed. The first consisted of £3900 of 4 per cent. perpetual debenture stock of the Ascot District Gas Company, which fetched an average of £105 5s. 2d. per £100, returning the purchaser £3 16s. per cent.; the second was an issue of similar stock of the Southend Water Company, which was sold at an average of £125 9s. per £100, returning £3 3s. 10d. per cent.; and the third was £5000 of ordinary (5 per cent.) stock of the Guildford Gas Company, which fetched on an average £125 2s. 5d. per cent., returning £3 19s. 11d. per cent. The final lots consisted of three £100 parcels of original ordinary consolidated stock of the Brighton and Hove Gas Company, carrying a dividend of 11½ per cent. They were sold at £291 each, at which figure they return the purchaser £3 19s. per cent. This price was several points above the Stock Exchange quotation, as was also the Tottenham figure; the "C" stock of that Company, though not officially quoted, ranking with the "B," which last Tuesday stood at £205 to £215 *cum div.*, whereas the new stock does not bear interest till April 1. A noteworthy feature of the sale was the fact that stocks and shares in five out of the seven Companies appearing in the list were new issues by order of the Directors. At the close of the sale, Mr. Richards announced that the Directors of the Plymouth Gas Company had placed in his hands the issuing of £10,000 of ordinary 5 per cent. stock; the sale to take place on the 7th of March. The Directors of the West Ham Gas Company have also instructed him to issue 2500 £10 shares in that Company on the 29th of March; and he will shortly be selling 650 shares for the Directors of the Lea Bridge Gas Company. On the 14th inst., he will offer the following stocks and shares by order of Directors: £2500 of 4 per cent. perpetual debenture stock of the Great Yarmouth Water Company; £3500 of 5 per cent. ordinary stock of the Crays Gas Company; and 150 £10 shares in the Whitchurch and District Gas Company.

Free Gas-Fitting and Prepayment Meters at Huddersfield.—The Gas Committee of the Huddersfield Corporation have decided that in future all gas heating and cooking appliances for domestic purposes shall be fixed free of cost to the consumers; and automatic prepayment meters for gas cooking purposes will be supplied free after the 1st of April.

OPENING OF A NEW RETORT-HOUSE AT THE WORTHING GAS-WORKS.

Installation of Chester's Regenerative System.

Owing to the increased demand for gas at Worthing, where the make has risen from 56¾ million cubic feet in 1890 to nearly 82 millions in 1896, according to the last Parliamentary Returns, with a proportionate further advance in the year just closed, it was deemed advisable some short time since to strengthen the productive power of the works. Before any decision was come to on the matter, the Engineer and Manager of the Gas Company (Mr. W. A. Walker) and the Chairman (Mr. H. H. Gardner) visited a number of the leading gas-works in the country to inspect the different carbonizing methods in operation; and they ultimately selected Mr. Chester's as being the most likely to fulfil all the requirements of the Worthing works. It was thereupon determined to put up a retort-house fitted with regenerator furnaces on that gentleman's principle; and the whole of the work in connection therewith was entrusted to Messrs. R. Dempster and Sons, Limited, of Elland, who have carried it out under Mr. Walker's supervision, and to his entire satisfaction. The house contains twelve settings of eights, six of which are in operation with excellent results for the Company. They effect a saving equivalent to 3 cwt. of coke per ton of coal carbonized, which, at the high price realized for this product in the district, will, it is confidently expected, be the means of clearing off the cost of the installation in less than one lifetime of the retorts. Apart from this, there is considerable saving in the cost of labour for carbonizing. The new house is equal to more than double the present maximum output, and more than twice the output of the old retorts occupying a similar area This important addition to the Company's plant was inaugurated last Saturday, when the works were inspected by the Chairman and Directors and several gas engineers, including Mr. Chester, Mr. J. W. Helps, Mr. W. Woodward, Mr. S. B. Darwin, Mr. Robert Porter, and Mr. R. G. Shadbolt. Messrs. Dempster's Manager (Mr. J. W. Broadhead) was in attendance, and with Mr. Walker, accompanied the party, and explained the leading features of the system—a special one being the boiler for supplying steam to the producers from the low waste heat of the settings. At the entrance to the subway of the house is a hydraulic lift, worked by the ordinary water pressure in the town, by which the ashes are raised to the yard. At the close of the inspection, the visitors, together with several members of the Corporation and local officials, partook of luncheon, on the invitation of the Directors of the Company, at the Royal Hotel—Mr. Gardner presiding. The Mayor (Captain A. B. Siddons Fraser) was unfortunately prevented by illness from being present; but Alderman Piper, a predecessor in office, testified to the good feeling existing between the Company and the Corporation, and to the desire of the latter to have the town lighted by incandescent burners. There were other unavoidable absentees; but, on the whole, there was a good representative gathering to congratulate the Company on the new departure in gas making just inaugurated, and to wish them continued success in their undertaking.

PATENT GAS ENRICHMENT SYNDICATE, LIMITED.

A prospectus is in circulation of a Company with the above title, to exploit "a home industry to yield large profits"—To whom? it may be asked—for the purchase of the patent rights of a Mr. Herbert John Dawes, for "Improvements relating to the Distillation and Breaking up of Liquid Hydrocarbons and Similar Substances," dated Jan. 30, 1897. This "duly sealed" patent, as well as the fact that "Foreign, American, and Colonial patents, when granted, will become the property of the Syndicate," may entitle the Company to claim for their "Richolene" that it is "a superior gas enriching spirit;" but there is nothing in the specification of the patent that makes this clear. The following sentence in the prospectus, too (printed in bold black type), would probably be difficult to substantiate: "The eminent authority, Mr. George Livesey, whose letter appears at the head of this prospectus, is generally in the van of progress, and there are hundreds of other high authorities connected with gas undertakings who appreciate and will be prepared to accept the advantages offered by the patented plant and patented process controlled by this Syndicate." As only £40,000 in all of share and debenture capital is offered, it is hardly likely that much of it will find its way into the hands of technical readers of the "JOURNAL." Lest, however, any may be tempted to subscribe, as well as to place on record in our pages the views of a pretty influential contemporary, we reproduce the views on the subject of this "Parent Syndicate" held by the "Financial News."

In last Thursday's issue of that paper was the following: When a prospectus is issued which bears at foot in extra bold type the announcement: "This Prospectus will NOT be Advertised," one is naturally set wondering whether this arises from a prudent resolve to keep down the expenses of flotation or from a wish to avoid that fierce light of publicity which is generally directed upon new and strange ventures. Be it as it may, the fact remains that the words above quoted are printed at the end of the prospectus of the "Patent Gas Enrichment Syndicate," which announces itself as a "parent syndicate formed to acquire valuable and exclusive patent rights," &c., and "primarily to acquire the valuable patent rights and special process for the manufacture of 'Richolene,' which is a superior gas-enriching spirit," &c. The fact that a gentleman well known in the gas world has written a brief note declining the honour of joining the Board, is made use of by the promoters to put very prominently on the endorsement fold of the prospectus the statement that he has "written letters as enclosed"—a warily-worded phrase—the said letters containing nothing which could be said to indicate special approval or support of the project, further than the courtesy phrase that he is "glad to hear" such a Company is being formed. The Board of Directors appears to consist of two gentlemen; and when we add that the first of the names is that of Mr. T. Fenwick, of No. 63 and 64, New Broad Street, E.C., the hero of so many curious insurance projects, we shall have said enough to be construed as a word to the wise.

THE METROPOLITAN WATER SUPPLY COMMISSION.

Sixth Day—Monday, Jan. 24.

(*Viscount* LLANDAFF, *Chairman*, *Sir* JOHN E. DORINGTON, Bart., M.P., *Sir* G. B. BRUCE, M.Inst.C.E., *Major-General* A. DE COURCY SCOTT, R.E., *the Right Hon.* J. W. MELLOR, Q.C., M.P., *Mr.* A. DE BOCK PORTER, C.B., *Mr.* H. W. CRIPPS, Q.C., and *Mr.* R. LEWIS.)

The Commission sat again to-day in the Moses Room of the House of Lords.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. BIRCHAM AND CO.

On the resumption of the proceedings,

Mr. BALFOUR BROWNE said the County Council had never had any desire to make a case; and that all the evidence they had tendered had been, as the Council understood it, in answer to a written requisition of the Commission. If they had gone beyond this in any way, they were very sorry; and if the Commission narrowed or restricted the lines of the evidence they desired, the Council would endeavour to confine themselves to them. The Chairman had expressed a desire to see the results of provincial purchases. This was an important matter; and he (the learned Counsel) wished to know whether the Chairman would like the evidence to be given directly by the various Town Clerks, or whether he would allow it to be tendered by an officer of the County Council.

Mr. PEMBER said he should raise no objection to its being given by an officer of the County Council in the first instance, provided opportunity to test the evidence were given.

The CHAIRMAN intimated that the evidence would be accepted from the officer of the County Council in the first place.

Mr. BALFOUR BROWNE added, with regard to the view the Chairman had expressed as to the Balfour Commission, that the County Council had tried not to go behind the report of the Commission, but simply to give information that had transpired since.

The CHAIRMAN remarked that they had allowed Sir A. Binnie to go beyond the report in certain matters.

Sir *A. Binnie*, in further examination by the CHAIRMAN, said pipes should be laid at a depth of more than 2 ft. 6 in., to avoid the risk of frost and consequent breakages. He could not say what length of the Companies' existing mains were laid at a less depth than 2 ft. 6 in. The Southwark and Vauxhall Company were authorized to draw 24,500,000 gallons daily from the Thames. But in 1892, the average daily overdraft was 3,600,000 gallons; in 1893, 4,500,000 gallons; in 1894, 4,900,000 gallons; in 1895, 8,900,000 gallons, and in 1896, 7,500,000 gallons. This overdraft had since been legalized, but was subject to another application being made to Parliament in the coming session. He produced a table giving the estimated average and maximum supplies of the New River Company at intervals between 1895 and 1915, as laid before Sir Joseph Pease's Committee in 1896, from which it appeared that the quantity that would be required in 1915 averaged 77,291,000 gallons daily; whereas before Lord Balfour's Commission, the estimate of what would be required in 1931 was put at 47,250,000 gallons. Similar figures were also given with regard to the other Companies; the object being to show that the estimates given before Lord Balfour's Commission were a little sanguine. He thought 35, or perhaps 40 gallons a head daily was a sufficient allowance for the Metropolis. He handed in a table showing the powers to construct works and to raise additional moneys granted to the Metropolitan Water Companies from 1891 to 1897 inclusive. The total amount authorized was £5,420,000, of which £1,000,000 was for the Staines Reservoirs Scheme. None of the rest was for the acquisition of any fresh sources of supply. Another table which witness produced gave the percentage of maximum month of daily supply over average daily supply for 1896, in the case of each of the Companies. With the Chelsea Company, the maximum month was July, with a consumption of 14,182,966 gallons; the average over the whole year being 11,720,472 gallons—a difference of 2,462,494 gallons, or 21 per cent. The percentage of the other Companies was: East London, 16·7; Grand Junction, 20·3; Kent, 20·5; Lambeth, 26·9; New River, 21·2; Southwark and Vauxhall, 12·4; and West Middlesex 15·4. Taking 20 per cent. above the average of the year to represent the demand of the maximum month, gave an average annual daily supply in 1931 of 554,507,690 gallons, and an average daily demand in the maximum month of 665,409,228 gallons. Applying this 554 millions to the 11,191,934 persons who, in the opinion of Lord Balfour's Commission, would require water in 1931, they got the fact that the population would then be supplied at the rate of 49·55 gallons per day. That such a figure was not impossible was shown by Glasgow, where from 1892 to 1897 the amount varied from 50 to 54½ gallons. As indicating what English speaking people did, and could, use, he handed in another table giving the consumption of thirteen cities in America and Canada, where the daily average per head ranged from 51 gallons in Providence to 325 gallons in Buffalo.

By Mr. MELLOR: His figure of 35 gallons per head for London included the domestic and trade supply, and the fountains. The Trafalgar Square fountains, however, obtained their water from a special well in Orange Street, which also supplied some of the Government Departments. The whole of Water London should be administered as one concern. There would be no difficulty in making physical connection between the different systems, and great advantage would result in such a case as occurred in East London, when they were short of water, and, as a fact, did make connection between the East London and the New River mains. Placing the control of all the Water Companies in the same hands would end, once and for all, the continued inquiries on the London Water Question which had been going on since 1811; and would at the same time carry out the recommendations of the Duke of Richmond's Commission, Sir William Harcourt's Committee, the Inquiry before Sir M. W. Ridley in 1891, and Sir J. Pease's Committee. It would place London in a similar position to that which it had been found most expedient to adopt in all other large towns in Great Britain and Ireland, and which had proved most conducive to the public interest in the United States of America; and it was a duty which the Government placed in the hands of nearly all the municipal bodies in India. According to all authorities on the subject, Lord Balfour's Commission, the recent evidence of the Water Companies, and the investigations of the County Council, the present supply must be more than doubled in the next thirty or forty years; and it was expedient that these new works should be carried out by some public body, and not by commercial companies. The present supply might be taken for the year 1896 at 198 million gallons a day; the capital cost of which was £16,531,346, or £83,492 per million gallons supplied daily. Had these works been carried out by the Metropolitan Board of Works and the County Council, they would no doubt have been treated in the same way as the main drainage expenditure. On drainage works about £7,750,000 had been expended, of which £3,500,000 had been paid off; so that the debt now stood at only £4,250,000. In these circumstances, he held it to be expedient that the large expenditure which was inevitable in the future should be placed in the hands of a public body, rather than in those of companies. The County Council were the proper body to be entrusted with this work. The Metropolitan Board and the County Council had, with great success, carried out the other great branch of their work, the main drainage of London; and so intimately connected with the public health were drainage and water supply, that it was most desirable that they should be in the same hands. From his experience of over 25 years, he considered it greatly to the advantage of the public at large that water supply should be vested in a public representative body. Water-works conducted by a public authority might be said to be under the direct control of the consumers, just as drainage and other matters of sanitation were at the present time. That public bodies could efficiently carry on water supply, was the universal experience of Great Britain, America, and India; and the success which had attended the management of the main drainage of London by the Metropolitan Board and the County Council, and the relief afforded to Parliament since the establishment of the Metropolitan Board of Works in 1855, was proof that a public representative body in London could also undertake the work of water supply. The water would be about as cheap to the consumer in the long run; but there would be a period, during which large extensions were being carried out, when probably there would be a slight increase in the rates. Ultimately, however, he thought there would be a small reduction. The tendency would be to provide purer water, as was shown by the action of Glasgow, Manchester, Liverpool, and Birmingham, who had gone long distances to procure better water. The great difficulty the County Council felt in exercising effectual control was obtaining an Act which would give such power. Then, as they held that the Companies would ultimately have to be bought up, any effective control would be regarded as a menace; and it would be said that the Council were harassing them in order to lessen the price to be paid. No control would be effective in which the consumers had not a direct voice.

By Sir J. DORINGTON: He thought Parliament could not impose upon a commercial company any such condition as that they must go to Wales to supplement their supply; yet he believed the time was not far distant when it would be necessary to go outside the Thames Valley. As to duplicating the mains in London streets, engineers nowadays could do anything; but he should, owing to the number of pipes already laid, be sorry to see this done. One further power of control needed was in regard to the sources of supply. It was a delicate point as to what check there was upon a Company taking more than their authorized quantity, seeing that one Company were now drawing from 3 to 3¼ million gallons more than their proper amount, and no one interfered. He did not complain of the state of the water that was delivered; but Thames water being what it was, they were always liable to an outbreak of disease. What would be the effect if there were an outbreak of typhoid fever at one of the towns just above the great intakes—at Walton or Staines? It would be most disastrous; and the risk should not be run further than could be helped. A public body would be able to exercise greater supervision over the fittings than the Companies could. There was no physical difficulty in passing water into houses through meters; but it would be very costly. Further, there were many compound houses; the rates being paid by the owner, who would then be interested in restricting the supply. This was not as it should be, for it would destroy practically the effect of the constant supply.

By Mr. DE BOCK PORTER: Under the Act of 1894, the Thames Conservancy exercised much greater powers with regard to preventing the pollution of the river. He explained the Staines Reservoirs Scheme; and said that to meet the varying flow of the river—its falling very low for three or four months at a time—90 days' storage in these reservoirs must be provided. The Staines Scheme, as sanctioned by Parliament, should be carried out; and then they should go to Wales. A very small portion of the money authorized since the Balfour report would be remunerative. In the case of the Southwark and Vauxhall Company hardly any would be so, because they had no district in which to expand. He regarded the financial condition of this Company as one that could not be supported at its present level much longer. If the concerns were under one central body, probably the extreme rates of some localities would be reduced.

By Mr. CRIPPS: He had no fault to find with the measures of the Conservancy to check the pollution of the Thames.

By Major-General SCOTT: He believed the time would come when the population of London would be so large, and the consequent pollution of the river so great, that the Companies would have to abandon their present sources of supply. He had never, however, regarded the question from the point of view that this made it desirable not to acquire the Companies' undertakings. Witness was then taken through a long calculation, with a view to showing what would be the cost of utilizing the 420 million gallons which, according to the Balfour report, was the total quantity available from the Thames and Lea Valleys. To complete the Staines Reservoirs Scheme, together with the money authorized, a sum of £15,000,000 or £16,000,000 would be required, to which would have to be added the capital expenditure needed to utilize the balance of the water which Lord Balfour's Commission said was available; and this witness

estimated, roughly, at £15,000,000 more. This 420 million gallons would be exhausted by about 1931; and it would be necessary to have ready by that time a further supply, for which he should go to Wales. He should allow about fifteen years for the construction of the works, and about £14,000,000 as their cost.

Some remarks then passed as to when the cross-examination of the witnesses by Counsel was to take place; the Chairman eventually deciding that it should be at the close of each witness's examination by the Commissioners.

The seventh sitting of the Commission was held yesterday—Lord Llandaff presiding, and all the members being present. Sir A. Binnie, in reply to Mr. J. W. Mellor, said the Serpentine drew its water from an independent supply, and the lake in St. James's Park, partly from a well and partly from one of the Water Companies. The public gardens he thought generally had private supplies. In reply to the Chairman, he stated that the County Council had two storm-water outlets from main sewers crossing the Lea at Old Ford. In times of rainfall—and there were very few in the course of the year—these two sewers would discharge untreated storm-water sewage into the Lea. The Chairman asked if the river below this point was considerably more foul than above it; and witness said undoubtedly it was. These two sewers were, he added, the property of the London County Council. Witness was cross-examined at considerable length by Mr. Pope, Q.C., regarding his suggestion that the undertakings of the Water Companies should be purchased by some central water authority; that the existing supply should be maintained, as at present, as long as it would last; and that any supplemental supply should be drawn, not from the Thames, but from other sources. On the central authority, the consumers would be represented in proportion to the water they took. Thus the London County Council would be represented to the extent of 79½ per cent., and the surrounding districts in proportion to their interest. The purchase should be made by the County Council, failing agreement, under arbitration; and he held the complication of the whole question to be such that the provisions of the Lands Clauses Act should be varied, and a special arbitration clause provided.

HARROGATE WATER-WORKS PURCHASE ARBITRATION.

Westminster Palace Hotel.—Thursday, Jan. 20.

(*Before* Mr. SHIRESS WILL, Q.C., *Umpire.*)

Mr. J. MANSERGH, M.Inst.C.E., was Arbitrator for the Corporation; Mr. T. FENWICK, M.Inst.C.E., acted in a similar capacity for the Company. Mr. BALFOUR BROWNE, Q.C., and Mr. W. MACKENZIE appeared for the Corporation; Mr. TINDAL ATKINSON, Q.C., and Mr. HONORATIUS LLOYD represented the Company.

At the close of the evidence given for the Harrogate Water Company, as reported last week,

Mr. BALFOUR BROWNE, opening the case for the Corporation, said if this were the best water-works in the world, it ought not be treated on the 2¾ per cent. basis, seeing that this was the interest on Consols. The multiplier to be applied largely depended on the security of the £5336, the amount of the divisible dividends, *plus* £713 interest on debentures; the latter item having to be paid before the dividends could be distributed. This question of security turned mainly on whether they had sufficient water to maintain the production of these two sums; and the test of the capacity of a water-works was what it could supply over a period of three dry years. He took the figures of 1887, 1888, and 1889—the three driest of recent years—which gave a net available rainfall of 7·35 inches, against the figure of 9·8 inches which the other side used. The 7·35 inches gave, with 64,000 gallons from the springs, 537,156 gallons a day, which was obviously insufficient for the consumption even of 1893—viz., 642,798 gallons—and still less so for the supply at the present time, when the population, and consequently the consumption, had largely increased. Regarding the contention of the Company that the consumption per head had unduly grown—it being 25·7 gallons in 1889 and 34·8 gallons in 1887—and that there was therefore considerable waste going on, he asserted that the increase was quite explained by the additional number of baths and water-closets, and further that the waste was nothing above the average in connection with other companies. The test of the Engineer was entirely unreliable, seeing that only one was made, and that even then the consumers were not cut off from the reservoir when the quantity flowing from it was taken. Having regard to these facts, he submitted that 36·36 was a ridiculous multiplier, and that some figure between 30 and 33⅓ was ample. Dealing with defects in the works, he pointed out that even the Company allowed £1000 for extra filters; and as to the reservoirs, his evidence would show the necessity of lining them with either concrete or bricks, the cost of which would be about £9400. These two figures should be deducted from the amount of the award. The claim in respect of the conversion of the debenture stock into preference stock was quite improper and immoral. If they had tried to do it, the Corporation would certainly have obtained power from Parliament to prevent them. Further, under the Companies' Clauses Act, 1845, they would only be able to convert a "part;" and since the notice to treat had been given, the Company not previously having performed the operation, the power to do so had gone. Therefore this claim should be entirely disallowed. Counsel, in conclusion, dealt at length with the sum of 10 per cent. allowed by the Company's valuers for compulsory sale; asserting that the cost of re-investing, which was the principal reason advanced in its favour, was infinitesimal, and that 5 per cent. was very liberal.

Mr. *G. H. Hill*, M.Inst.C.E., examined by Mr. BALFOUR BROWNE, said he should test the works of the Company by their capacity to produce water over the three years 1887, 1888, and 1889. The average rainfall of these years was 22·35 inches, from which he deducted 15 inches for evaporation and absorption, leaving 7·35 inches as the available water. The 15 inches for evaporation and absorption was a small allowance, because the collecting area was very flat, and as the rain fell it was almost laid out to dry. The 7·35 inches, on 1030 acres, gave 469,371 gallons a day. As to the springs, the gaugings over 1896 gave an average of 64,000 gallons daily; but that being a year of very large rainfall (7·79 inches above the average), he reduced the average to 45,000 gallons. This made the available rainfall 514,371 gallons. Some credit certainly ought to be given on account of the storage; he therefore called the 514,371 gallons roundly 550,000 gallons, which was all the Company could rely on daily over a period of three dry years. Yet the actual consumption in 1897 was 926,000 gallons a day. To make the new works necessary to place them in a safe position, would take four years. In 1897, the profit on the sale of 926,000 gallons daily was £8791, and on 550,000 gallons daily it would therefore be £5220; whereas the sum required to pay the dividends was £5336, besides which there was £700 for interest on the mortgages. The dividends consequently could not be maintained. To the figure of £5336 he applied 33⅓ as the proper number of years' purchase to allow, which gave £177,867. This being a first-rate price, the concern should be in first-rate condition, and should not need any special outlay. The slopes of the reservoirs, however, required pitching. This would need 8167 cubic yards of concrete, which, at £1 a yard, made £8167—roundly, £8200. Then he allowed £1000 for the additional filters required. Deducting this £9200, left £168,667 as the final figure of his valuation. As to the allowance for compulsory sale, he thought 5 per cent. quite sufficient, but had not included it—preferring to leave that to the Umpire.

Cross-examined by Mr. TINDAL ATKINSON: The lining of the reservoirs was to preserve the purity of the water. When lined, the reservoirs could be swept and cleaned. The water was now quite fit for domestic use in every way. It would not interfere with the service of the town to pitch the slopes of the reservoirs with concrete. While saying that the filtering areas must be extended, he did not assert that the filtering was not now properly done; he had in mind the future. Witness was then taken through a very lengthy and complicated calculation, with a view to showing that, even on his own figures as to rainfall, the supply during three dry years would be considerably greater than he had estimated; but he declined to admit that this was so, one point of difference being that witness would not accept that the reservoirs would be full at the start of the period, though he agreed that they might. The Company were not short in the years 1887, 1888, or 1889 because the consumption was so much less then than now. As to the rain-gauges, witness held that those taken actually on the ground, which were those he took, were more reliable than those taken and corrected by Mr. Symons over a larger district. Even taking the rainfall at 9·8 inches, it would only make a difference of 130,000 gallons a day, which would not supply what witness suggested was the deficiency. The test of three dry years was a severe, yet proper, one of the capacity of all water-works. In this district, he wanted water from the drainage area and storage sufficient to take him over 200 days; and then something should be left in the bottom of the reservoirs. The consumption of 34·8 gallons per head in 1897 was high; but he should have estimated it at between 30 and 35 gallons. He knew the figure at Tunbridge Wells was low, but not that it was 15 gallons per head. He believed no water beyond the average was wasted. Between 3 and 4 a.m. was the best time for testing waste. In the test made in that hour, he heard the quantity flowing from the reservoir was nearly 8000 gallons; but he could not say how much would be waste.

Re-examined by Mr. BALFOUR BROWNE: The Company would not feel the pinch of the shortness of the supply in the early years of their existence, because the consumption was small. In calculating the water in the reservoirs, allowance should be made for the necessity of leaving 10 feet of "bottom water." He did not now count the storage as augmenting the yield, though he had done so in other valuations. Storage was required to equalize the yield.

Mr. FENWICK: From the figures you have given us for dry years, do you anticipate a water famine in Harrogate should it be dry next year?

Witness: I do certainly.

Mr. *G. F. Deacon*, M.Inst.C.E., examined by Mr. MACKENZIE, said assuming the works to be in such condition that they could continue to supply the full amount of water demanded until others could be constructed, he should put the value at 33⅓ years' purchase of the divisible profit. The works were not quite up to such a standard; but he had nevertheless allowed the figure. They were not able to supply the present population; and Harrogate, being a "single industry" town, was not in so stable a condition as a place with more industries. Multiplying £5336 by 33⅓, gave £177,867, from which he deducted £1000 for filter-beds and £9400 for cost of repairing service reservoirs—leaving £167,467. The discrepancy between his £9400 and Mr. Hill's £9200, in respect of the concrete for the reservoir, was due to witness not having the exact figures as to the slopes. The figure per yard was the same in both cases—5s. Concrete, he thought, was not trustworthy for this purpose, as it fractured from expansion and contraction; but it was not right to call upon the Company to put the reservoirs in such condition as he should now build them in if doing the work anew. He would prefer stone or blue bricks upon concrete. He made the available rainfall average 528,300 gallons a day, which, with 45,000 gallons from the springs, gave 573,300 gallons; while the amount supplied in 1897 was 926,324 gallons daily. Thus there was no doubt that in the driest seasons the Company could not provide the statutory dividend and interest on the debentures. He made an allowance for leakage, reducing the daily consumption to 31·4 gallons per head; but even on this basis the supply could not be maintained. As to the saving Mr. Henshaw claimed, witness had discovered that the indicator of one of the gauges was not recording truly, the effect of which would work out to 18,870 gallons a day. This went to show that the quantity of water being taken was higher than was shown by the books. The saving of 29,000 gallons a day would thus be reduced to 10,130 gallons.

Cross-examined by Mr. TINDAL ATKINSON: Mr. Henshaw's way of measuring by the fall in the reservoir was very doubtful. He obtained the figures on which his estimate for concreting the reservoir was based, from the late Engineer before the present sittings began. He held that practically there was no waste in the town; the water which flowed away during Mr. Henshaw's test being largely accounted for by the ordinary use of the inhabitants. Supposing that all the 7000 gallons which went between 3 and 4 a.m. were waste, it could not be much reduced. If the Company were unfettered by the conditions of the present transfer—which excluded consideration of the Acts of last session—and they could go to Parliament for a further supply, he should say this was one of the best investments. He generally omitted the 10 per cent. allowance from his valuations.

Mr. *Corbet Woodall*, M.Inst.C.E., examined by Mr. BALFOUR BROWNE,

said he had had great experience in water and gas undertakings. The Harrogate works, up to the amount it was said they could supply, were good of their kind. He largely corroborated the preceding evidence. In his valuation, he had distinguished between the preference and ordinary stock, because, however well the ordinary stock was secured, the preference must be better. The dividend on the preference stock was £560; and this he capitalized at 36½ years, which gave £20,362. The ordinary stock dividend—£4776—he took at 33½ years, which gave £159,200. This made a total of £179,562. Adding 5 per cent. for compulsory purchase, brought the figure to £188,540. From this sum he deducted £10,300, expenditure necessary to put the works in proper condition; leaving £178,240.

Cross-examined by Mr. TINDAL ATKINSON: The very highest number of years' purchase he had ever allowed was 33½. This was a very good concern; and shares in first-class water undertakings were sold to pay a little over 3 per cent.

Mr. TINDAL ATKINSON: Do you anticipate a water famine in Harrogate, say, next year?

Witness: If next year is dry, I should, most certainly.

And do you mean to say, with this prospect in view, you would advise an investment at the rate of 3 per cent.?—I am sorry if you regard me as having put it too high; but I remember that in the famine of 1893, the Company were able to supplement their supply by pumping.

Mr. *Charles Gott*, M.Inst.C.E., examined by Mr. BALFOUR BROWNE, gave corroborative evidence. Harrogate was in an exceptional position in that the town contained a larger proportion of big houses than usual; and the general rule was that the higher the class of houses, the greater the consumption of water. Then, too, at a time when the sources were yielding the minimum, there was an influx of visitors—5000 or 6000 in the height of the season—which meant increased consumption. He saw no important waste of water that was preventible. He pointed out that in the last seven years the rainfall exceeded that of the previous seven years by 36·37 inches—an average of something over 5 inches per annum—which more than accounted for the Company's good fortune in being able to tide over the difficulties of supplying until the present time. It was exceedingly unlikely that this good luck would continue. The great success of the Company, and the fact that they were able to distribute their maximum, and also have a surplus, was due to the fortuitous circumstances of the large rainfall. The Company, he considered, would be unable to maintain their revenue. Believing the works to be defective and deficient, he applied 30 as the number of years' purchase of the concern. This gave £160,080, to which he added 5 per cent. for compulsory sale—making £168,084.

This concluded the evidence; and the proceedings were then adjourned.

Saturday, Jan. 29.

Mr. BALFOUR BROWNE, in addressing the Umpire on behalf of the Corporation, said all the valuations were started with the figure £5336—the dividend the Company could divide, and which, *plus* £713, made £6049, the sum the Company must earn to maintain their present position. The multiplier would depend upon what view was taken of the security; and in contending, as he did, that they had not sufficient water to enable them to earn this dividend in the future, he struck at the very root of the security. Mr. Symons agreed with him that the rainfall, as shown by gauges actually on the ground, was 19·69 inches in 1887, 27·6 inches in 1888, and 19·65 inches in 1889; these being the driest years on record. This gave an average of 22·35 inches; and it was on this basis that the Company's capacity should be judged. What merit was there, therefore, in the Company having managed to continue the supply over 1893, and subsequent years, seeing that the rainfall in those years in each case much exceeded the average? If the rainfall in 1893 had only been this 22·35 inches, the Company must have miserably failed in their supply. On the basis of 22·35 inches, the available rainfall would be 7·35 inches, which, on the collecting ground of 1030 acres, meant a supply of 469,371 gallons per day; or, taking the springs at an average of 45 gallons, the total supply would be 514,371 gallons daily. Some credit was to be taken for storage; and this Mr. Hill did by raising the 514,371 gallons to a round figure of 550,000 gallons—in other words, allowing 35,629 gallons a day for storage. This 35,629 gallons, multiplied by 1095 (the number of days in three years), gave 39,013,755 gallons as the excess of the ordinary storage, which was necessary for equalization purposes. Mr. Burstal, the Company's own witness, only allowed 19,500,000 gallons. Testing the sufficiency of this supply in a very dry year (1893), he found that they had then exhausted their resources, supplying 642,798 gallons per day. The rainfall in that year was 24·38 inches, which, less the agreed figure of 15 inches for evaporation, left 9·38 inches as the available rainfall. It was agreed also that in three dry years the available rainfall was 7·35 inches. Reducing the supply of 642,798 gallons in proportion, they obtained 503,695 gallons as the average quantity available, against which Mr. Hill had allowed 514,371 gallons. Since 1893, the Company had added 30 million gallons of storage. But Mr. Hill had allowed 39 million gallons; so that there was nothing to be made out of that. As to the 200 days' storage (151 million gallons), this was simply a means of equalizing the rainfall over the year—of spreading what was collected in the wet months over the dry ones. It did not add a gallon to what the Company could distribute in the year. Then it was contended that a saving in the consumption and a reduction of waste could be effected. Mr. Henshaw, the Engineer, however, admitted that the gauge on which he calculated the saving he claimed of 208,000 gallons a week was out of adjustment to the extent of $\frac{1}{16}$ inch, and that this would account for 84,000 gallons of the 208,000 gallons. But Mr. Deacon, who had had a great deal more experience, found the gauge out of adjustment to an extent which would account for 132,090 gallons a week, which, taken from the 208,000 gallons, left 77,000 odd gallons, or 11,000 gallons a day, which was a ridiculous figure to base a saving upon. As to the leakage, Mr. Henshaw again admitted that the 7511 gallons which passed out of the reservoir between 3 and 4 a.m. on the day when the test was taken was not all waste, seeing that all the consumers were not cut off; and, further, they had it from Mr. Burstal that some of the public urinals used water night and day without meter. Surely this was sufficient to account for the alleged waste. Having regard to all these circumstances, Counsel held that the Company were certainly not well-secured, inasmuch as it was abundantly proved that there was not a sufficiency of water to maintain the income. Therefore the large multiplier of 36·36 years could not be sustained. Even if the concern was a first-class one, 33½ years would be ample; and this was the figure allowed. But the Company's witnesses themselves all admitted defects; and allowances were made for insufficient filtering space, and for the lining of the reservoir. With regard to the conversion of the loan capital, Counsel urged that this claim, which totalled £18,071, should not be allowed—first, because it had not been carried out; and, secondly, because he did not think they could legally do it after the notice to treat had been given, and then under their own Act they were only entitled to convert a part. As to the compulsory purchase, whether this was customary or not, it had a foundation in fact; being an allowance for damage which the award might not cover. In this case, the damage could be measured to some extent; and he urged that 5 per cent., the figure allowed by his witnesses, would cover it all.

Mr. TINDAL ATKINSON, in reply, said the four points in difference were as regarded the multiplier, the deductions, the conversion, and the 10 per cent. allowance. If it was proved that the Company had not sufficient water to supply the demands of Harrogate, that would affect the security, and therefore the multiplier. The Corporation valuers, after taking everything into consideration, had put the very higest multiplier they had ever placed upon any water-works; but if a water famine were in sight at Harrogate, surely the valuers had not done their duty to the Corporation in allowing so many years' purchase. If Mr. Balfour Browne's calculation were right, it would mean that, instead of 28 gallons a head, the supply would have to be reduced to about half that quantity. In this calculation, however, he took the allowance from the springs at 45,000 gallons, which was much less than it should be, because springs were not affected as soon as a drought occurred. Then, too, he only allowed 35,000 gallons a day on account of storage. The storage amounted to 151 million gallons, which was sufficient to last, supposing not a single drop of rain fell, at 926,000 gallons a day (the present consumption), about 5½ months. Adding, as he contended they were entitled to do, the mitigated rainfall as given by the Corporation, this would bring in sufficient to extend the full supply to something like eight months. It was not possible that the Corporation would run on their storage without restriction; they would probably average it over the year. Admitting his friend's argument, the supply to Harrogate would be half what it was now—14 gallons a head—which would not be altogether insufficient, seeing that at Tunbridge Wells, a place in some respects similar, the consumption was only 16 gallons. This led to the important question of waste; and here they had something better than the mere divergent evidence of Mr. Deacon and Mr. Henshaw. They had it proved that the consumption was 28 gallons per head daily for domestic purposes, which, seeing that the consumption was only from 20 to 24 gallons at other large towns, he suggested was out of all reason. They had it, too, that under the best conditions that could be devised 7511 gallons of water passed out of the reservoirs between 3 and 4 a.m.; and although many explanations had been offered as to where it went, none was satisfactory. Practically the whole of it was running to waste somewhere. It was said that a large quantity was going through the public urinals; but if that were so when the supply was plentiful, it could be stopped in time of drought, and the Company were entitled to credit for it. The 7511 gallons represented 6 gallons per head daily of the population; and adding this 6 gallons to the 14 gallons they arrived at 20 gallons as the available quantity in three dry years. There would therefore not be much of a water famine after all. The Corporation's figures of rainfall were based upon gauges kept on the Company's property by Mr. Dixon, the late Engineer. Yet, although these figures had been impugned, and Mr. Dixon had been present all through the inquiry, he had not been called. Mr. Symons' figures were taken over a wider area, and for a greater number of years; and if they were accurate, the supply in the dry period would be 18 gallons, which, *plus* the 6 gallons, would be 24 gallons. All this evidence as to deficiency was directed to reducing the number of years' purchase; but it was forgotten that, even if the supply was deficient, the Company had power to charge their full rates. Then, of course, they could, if the water really ran short, go to Parliament; and the excess of income over divisible profit could be applied to the construction of new works, so that the capital expenditure would be small, the dividends would be maintained, and the concern would remain a first-class investment. He contended that the security was such as to justify the high multiplier; and, in this connection, he pointed to the facts that they were now paying maximum dividends, that they had paid arrears of dividend in full, and that they were making a large surplus revenue which at the present moment amounted to more than £5000. As to the deductions for deficiency in filter-beds and lining the reservoirs (measures calculated to increase the purity of the water), he contended they were unnecessary, seeing that the water was drawn from an uncontaminated source, and that neither in these nor the parliamentary proceedings had anyone made a charge against its purity. So far from this, the Corporation handbook declared the supply to be abundant and pure. The conversion of the debentures, he admitted, was limited by the Act to a "part;" but inasmuch as "part" was not interpreted, he contended that the Company would satisfy the Act by leaving unconverted a very small sum. In conclusion, he alluded to the 10 per cent. allowance for compulsory sale. The almost universal practice, in cases under the Lands Clauses Act, was to allow 10 per cent., on the ground that the persons in possession being compelled to part with their property were entitled to some consideration beyond the exact market value; and he submitted that there was no reason in this instance why the percentage should be reduced.

Some conversation then passed as to the date as at which the transfer should be supposed to take place, how the concern was to be carried on subsequently, &c.; but owing to the absence of one of the gentlemen concerned, it was agreed to postpone the matter—the Umpire to be communicated with on the subject in the course of a few days.

The proceedings then closed.

Acetylene Gas for Railway Station Lighting.—The London and North-Western Railway Company have had an acetylene gas making apparatus fitted up for lighting Disley Station. The new arrangement is stated to work perfectly, and the light afforded is very brilliant.

CAMBRIDGE WATER-WORKS COMPANY.

The Late Secretary's Fraudulent Transactions.

The Half-Yearly Meeting of the Cambridge Water Company was held last Wednesday—the Rev. Dr. Perowne presiding. The discovery which had been made of extensive fraudulent dealings on the part of the late Secretary (Mr. Peed) in the Company's stock and securities, caused the proceedings to be of a somewhat exciting character.

In their report, the Directors recommended a dividend on the consolidated stock at the rate of 10 per cent. per annum, and on the amounts paid up on the new shares at the rate of 7 per cent. Referring next to the fraudulent dealings on the part of the late Secretary with the Company's stock and securities, the Directors stated that the question of the Company's liability in respect of these frauds was submitted to Mr. Cozens Hardy, Q.C., and Mr. Rawlinson, Q.C.; and under their advice the Directors arranged and settled with the holders of certificates of stock obtained under fraudulent transfers. The sum of £5511 10s. had been paid in settlement of claims out of funds available for the purpose. Some further claims were still the subject of investigation. But the Directors had reason to hope that the actual liability respecting these claims might be similarly met without prejudice to future dividends. The Directors also stated that they early considered the advisability of instituting criminal proceedings against the late Secretary. As soon as definite evidence of a criminal act was obtained, it was submitted to the Official Receiver in Bankruptcy, and then to the Public Prosecutor, by whom the affair had been taken up. Dealing with other matters, the report stated that the duties of Secretary were being temporarily discharged by the Manager (Mr. W. W. Gray). The new £10 shares issued under the Act of 1886 had been fully paid up; and it was proposed to convert them into consolidated stock. To meet the charges on capital account, the Directors proposed that the remaining 2000 new ordinary £10 shares (which were entitled to a maximum dividend of 7 per cent.) should be created. The Manager reported that 174 additional premises had been connected during the half year; making the total number now supplied 14,784.

The Chairman having formally moved, and the Rev. J. B. Lock seconded, the adoption of the report,

Mr. Hamblin Smith said he thought the Directors had wisely deemed it right to disclose, as far as they could with prudence, the actual state of affairs with regard to the defalcations. Acting under the advice of eminent Solicitors and Counsel, they had laid their statement before the shareholders, and with a further view, he had no doubt, to the avoidance of legal proceedings, which would probably be very long and costly, they had acted upon the same advice in making a settlement of certain claims. He also considered the Directors had done right in recognizing their duty to the public, by submitting—no doubt with some pain—the matter to the Public Prosecutor. In his opinion, too, the duties of Secretary and Solicitor should no longer be entrusted to the same person; and he hoped the arrangements which had been temporarily made with regard to the services of Mr. Gray (who had been so long and so faithfully engaged in the work of the Company) might be continued.

Mr. Palmer considered the Directors ought to have called a meeting of shareholders directly the defalcations were discovered, in order that their opinions on the matter might have been obtained.

Mr. Gray, replying to the question, stated that no bogus shares were issued, but stock of the nominal value of about £5000. It was not all issued at once.

The Rev. J. B. Lock could not understand how the Secretary could have issued bogus shares unless he forged certificates of the existing holders. He desired to know whether Mr. Peed not only sold the bogus shares, but forged the certificates to represent them, and whether the Directors had not been in the habit of requiring deeds and certificates to be produced when the shares were transferred.

Mr. Palmer asked if a qualified accountant had been employed by the Directors to go through the accounts for the past five years; what fund the Directors had thought fit to use to recoup the defalcations of the Secretary; and whether they had taken out a warrant for the late Secretary's apprehension.

The Chairman said he might answer the last question at once in the negative.

Mr. Palmer considered the Directors were neglecting their duty by not doing so.

The Chairman, replying to the discussion, said that no time was suffered to elapse after Mr. Peed's disappearance before the Directors took action. He felt they would not have been acting in the interests of the Company if they had immediately called a public meeting of the shareholders, seeing that they had very delicate negotiations to carry through. They directly obtained the best advice of Solicitors and eminent Counsel; and under this advice they had taken steps. With regard to the number of bogus shares issued, he thought the question was answered by the report, at any rate as fully as they thought fit while negotiations were still going on. One speaker had inquired whether the transferred certificates were always produced at the Directors' meetings. The custom of the Board so long as he had been a member of it—a long time before he was Chairman—had been to place the fullest confidence, and he thought until recently deserved confidence, in their late Secretary. He must remind the shareholders of the devotion with which Mr. Peed served the interests of the Company until recently; and by that very devotion, he obtained the confidence of the Board. He might say with regard to the Company's seal that it was placed in the Secretary's keeping, but not by the present Board; they were merely inheriting the traditions of those who preceded them. Directly they had any reason to suspect—not fraud, but irregularities—they took action. The seal was removed into other custody; and the utmost care was taken to see that certificates were signed and sealed, and that the old ones were duly cancelled.

Mr. Palmer: Was the seal removed from Mr. Peed's office before he started?

The Chairman: I may say that it was.

Mr. French: Was the seal in his possession when the bogus shares were signed?

The Chairman said he was afraid it was. He also stated that the claims had been settled from the accumulations of revenue.

Mr. Gray explained that the claims had been met out of a sum of £7000, which was the surplus revenue for sixteen years, and which had been used in the business instead of raising additional capital.

Discussion ensued regarding the appointment of an Accountant to examine the securities, stock, and accounts; and it ended by the Chairman stating that the suggestion would not be lost sight of by the Directors, who, if they thought it necessary, would call in a qualified Auditor.

The motion was then adopted, as were also the other recommendations of the Board.

A vote of thanks to the Chairman and Directors terminated the proceedings.

BIRMINGHAM CORPORATION WATER-WORKS.

Several matters of interest affecting the Water Department of the Birmingham Corporation are referred to in a report which the Water Committee have prepared for presentation to the Council. A previous report contained a proposal to obtain a temporary auxiliary supply of water from what is called the Perry sinking; and the present report shows that the necessary plant has been purchased and pumping has been commenced. The pump at present is lowered to a depth of 200 feet, and the water is taken at 180 feet—the yield at this depth being almost exactly half a million gallons per day. It is probable that by lowering the pump a greater yield can be obtained; but even for the half million gallons a day, the Committee consider that, in view of the exigencies of the department until the arrival of the Welsh water, it is worth while to continue the operations, and to lay the necessary mains for bringing the water into distribution. They have accordingly given notice to the owner of the property to take up a lease, at a rent of £750 a year for the water and land, and £30 a year for cottages and other buildings already erected, subject to certain conditions as to the quantity and quality of the water continuing satisfactory, and the termination of the lease. The Committee propose to convey the water to the middle reservoir at Witton at an estimated cost of about £5500. In July last a serious insufficiency of supply was experienced in Handsworth. On investigation it was found that the leading mains for the supply of the district had become inadequate in consequence of the rapid growth of the population. The Committee have therefore undertaken the laying of the new mains required at a cost of £4942. Concerning the Elan Valley works, the Committee report that a contract has been entered into for the erection of a new church to replace that at Nantgwillt, which will be submerged; the cost being £1771. The works in the Elan Valley have made good progress during the past year. A contract has also been entered into with Messrs. Morrison and Mason, of Glasgow (who are already carrying out the works from Dolau to Knighton) for the further section from Knighton to Downton, comprising the Downton syphon, two crossings of the River Teme, and an overflow at Knighton. The length of the aqueduct covered by this contract is 9 miles 33 chains, the whole of which is in pipe syphon. The amount of the contract is £234,818.

THE TYPHOID EPIDEMIC AT MAIDSTONE.

Proposed Purchase of the Water-Works by the Corporation—The Water Company's Liability.

At the Meeting of the Maidstone Urban District Council last Wednesday—the Mayor (Mr. J. Barker) in the chair—the Water Committee presented a report recommending that a Special Act of Parliament should be obtained for the purchase by the borough of the undertaking of the Water Company. The recommendation was approved—the whole of the members of the Council entitled to vote supporting it. The Mayor remarked that they had not at the present time a water supply sufficient for the town; and he questioned whether it would be right, looking at the action that was likely to be brought against the Water Company, to ask them, in addition to their existing heavy responsibilities, to expend thousands of pounds in improving the service. It was clearly the duty of the Council to see that the town did not suffer from a water famine in the summer. It was proposed by the Committee to purchase the water-works by arbitration or agreement. In the course of the discussion, the opinion was expressed that the ratepayers when polled would sanction the Council's proposal after their recent experience, though twelve months ago they rejected a similar resolution by a very large majority. The Council afterwards went into Committee to receive the opinion of Sir R. T. Reid, Q.C., M.P., Mr. A. Macmorran, Q.C., and Mr. H. Sutton, upon various points submitted to them in connection with the late epidemic and the public inquiry by the Local Government Board. Counsel's reply to the different questions laid before them were as follows:—

1.—We are of opinion that the Corporation have no right of action against the Water Company upon the facts stated. Whatever remedies there are attach to the individual persons who have suffered.

2.—We consider that, if the water supplied by the Company to their pipes was not pure and wholesome, any owner or occupier paying water-rate who has sustained danger thereby may recover compensation. If, after the Company having supplied to their pipes pure and wholesome water, it is polluted by others without any fault of the Company, then we do not think there is a liability. It is not possible, without full inquiry as to the facts, to state definitely that the epidemic was due to the pollution of the water before entering the Company's pipes, but there certainly is strong evidence that such was the case.

3.—It is only in the case of persons whose illness was directly caused by the polluted water that there is any right of action.

4.—If illness would not have been caused but for the condition of water-closets and drains, the Company is not liable.

5.—As things stand, we think the Corporation cannot safely expend money for this purpose [defraying the costs of professional representation and expert evidence at the public inquiry] without the preliminary sanction of the Local Government Board under section 294 of the Public Health Act, 1875. If at any stage the Corporation are attacked for neglect of their duties during the inquiry, they will be able to spend money in their defence, and to recoup themselves out of the general district rate.

6.—We think it right to draw the attention of the Corporation to the Public Authorities Protection Act, 1893. It seems to us that actions against the Water Company for damages caused by poisoned water ought in

prudence to be commenced within the six months specified in that Act, though it is difficult to think the framers of the Act intended such a result.

Upon the opinion, the Water Committee reported as follows: "This opinion takes your Committee by surprise. It entirely changes the whole position, and, having regard to the grave questions it raises, they recommend that a further effort be made to get the Local Government Board to give effect to the resolution of the Council of Jan. 12 [asking for a postponement of the public inquiry], and that at the same time application be made to them to sanction the expense of counsel, solicitors, and expert witnesses." This report was adopted, and a letter in accordance with its terms was despatched to the Local Government Board.

The Local Government Board have replied to the letter above referred to. They say they consider the Council had ample notice of the inquiry, and, having regard to the arrangements which have been made, they cannot consent to the inquiry being postponed. As to a suggestion to them that before the inquiry was held the report of Dr. Theodore Thomson should be published, the Board observed that, though Dr. Thomson visited the district with a view of rendering the Council and their officers any assistance which could be possibly given in the emergency, and though he made certain preliminary inquiries in the matter, those inquiries were not, and could not be, proceeded with, in consequence of its being proposed that a public inquiry should be held with respect to the outbreak. In the matter of sanctioning the payment of the costs of counsel, solicitors, and expert witnesses, the Board point out that they are not in a position to make any order until the inquiry has been held, and until they have before them the necessary facts to enable them to come to a decision on the subject. In conclusion, the Board state that the inquiry must be opened on the day fixed; but the Council will be at liberty, if they think fit, either on that day or at any subsequent stage of the inquiry, to apply to the Inspectors for an adjournment, which may then be granted for a limited time. In view of the position taken up by the Board, the borough Authorities decided not to engage counsel to represent them at the inquiry, but to place their interests in the hands of Mr. Rowley Parker (of Messrs. Sharpe, Parker, and Co.), London, and Mr. S. Lance Monckton, the Deputy Town Clerk. Mr. H. F. Dickens, Q.C., and Mr. G. F. Hohler have been retained on behalf of the Water Company.

Automatic Universal Gas Lighter, Limited.—Under this title a Company has been registered with a capital of £15,000, in £1 shares, to acquire any patents relating to gas lighters; and to carry on the business of engineers, metal workers, founders, fitters, ironmongers, &c.

Manchester Water for the North Cheshire Water Company.—The Directors of the North Cheshire Water Company have for some time past had before them the question of an increased supply of water to meet the rapidly growing requirements of their district. Negotiations were entered into with the Manchester Corporation; and finally a definite scheme was arrived at. It involved the laying of some long lengths of large mains between the systems of the Corporation and the Company, at a total cost of about £27,000. The work has now been finished; and Manchester water flowed into the Company's system for the first time last Tuesday.

OPENING OF MESSRS. RICHMOND AND CO'S NEW SHOW-ROOMS AND WORKS.

An interesting and unique departure in regard to the firm of Messrs. Richmond and Co., Limited, took place on Saturday last, when a large number of gas engineers and friends from all parts of the country met at the Company's new London show-rooms, 132, Queen Victoria Street, and, after viewing the handsomely-fitted show-room and lecture-room, proceeded by motor cars and broughams to the new works which have lately been opened at Stratford. On arriving there, the visitors were photographed, and then proceeded to inspect the premises. On all hands satisfaction was expressed at the admirable way in which they had been laid out. Their special feature is that the castings are received from Warrington, and the works have been so arranged that a stove is passed from one department to another, and finally finished and despatched, without having to be returned to any part of the establishment. One of the most interesting departments is a repairing shop, fitted up with machinery which has cost many hundreds of pounds to erect, for the repairing and cleaning of all makes of gas cookers and fires. In this way, Messrs. Richmond and Co. have met a long-felt want of all gas companies who let gas cooking and heating apparatus on hire. The show-room at Stratford is of a very extensive character, and has been purposely arranged to meet the requirements of the local Suburban Gas Companies' consumers.

At 2.30 the visitors drove to Crosby Hall, Bishopsgate, where a banquet was given. Mr. E. W. T. Richmond, the Chairman and Managing Director of the Company, presided, and Mr. G. F. L. Foulger, the Chief Distributing Engineer of The Gaslight and Coke Company, occupied the vice-chair. Over a hundred guests were present; and each was presented with a handsome *souvenir* in the shape of a "smoker's companion," the initials of the recipient being engraved thereon. After the usual loyal toasts had been honoured, Mr. Foulger proposed what was admittedly the toast of the evening—viz., "Success to Richmond and Co., Limited"—which was drunk with enthusiasm, and responded to by Mr. Richmond. In an interesting speech, the Chairman proposed the toast of "The Gas Industry and Our Guests." In the course of his remarks he said he thought the time would shortly come when gas companies would see the necessity of abolishing rentals for the hire of gas-cookers—a principle which had been attended with so much success at St. Helens and other places. Mr. Foulger, in reply, stated that while he was not authorized to declare any policy on behalf of The Gaslight and Coke Company, he was entirely in accord with the Chairman's remarks on the subject of the abolition of gas-stove rentals. Other responses to this toast were made by Mr. F. G. Dexter (Winchester), Mr. A. Mitchell (Bury St. Edmunds), Mr. J. H. Troughton (Newmarket), Mr. W. Duff (Morecambe), and Mr. E. Wigglesworth (Perth, West Australia). During the progress of the dinner, a selection of instrumental music was played; and an entertainment followed, which was keenly enjoyed.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 222.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	24—25	..	4 4 0
100,000	10	„	7½	Do. 7 p. c.	16½—17½	..	4 5 8
300,000	100	Jan. 3	5	Australian 5 p. c. Db.	105—107	..	4 13 6
200,000	5	Nov. 11	6½	Bombay, Ltd.	6¾—7¼	..	4 9 7
40,000	5	„	6½	Do. New, £4 paid	5—5½	..	4 14 6
380,000	Stk.	Aug. 27	12	Brentford Consolidated	300—305	..	3 18 8
240,000	„	„	9	Do. New	227—232	..	3 17 7
50,000	„	„	5	Do. 5 p. c. Prf.	145—150	..	3 6 8
159,375	„	Dec. 15	4	Do. 4 p. c. Db. Stk.	134—138	..	2 18 0
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	275—280	..	4 2 3
208,820	„	„	8½	Do. A. Ord. Stk.	200—205	..	4 2 11
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max.	130—135	..	3 14 1
420,000	20	Sep. 30	11½	British	56½—57½	..	3 18 3
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
71,000	10	„	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	9½—10½	..	5 17 1
98,122	Stk.	Dec. 30	4	Do. 4 p. c. Db. Stk.	96—98	..	4 1 8
150,000	20	July 15	8½	Cagliari, Ltd.	30—32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	17—18	..	4 8 11
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59—61	..	4 18 5
550,000	Stk.	Oct 14	13½	Commercial Old Stock	340—345	..	3 18 3
200,750	„	„	10½	Do. New do.	255—260	..	4 0 9
200,750	„	Dec. 15	4½	Do. 4½ p. c. Db. do.	154—157	..	2 17 4
800,000	Stk.	Dec. 15	12	Continental Union, Ltd.	250—255	..	4 14 1
200,000	„	„	9	Do. 7 p. c. Prf.	214—219	..	4 2 2
51,600	Stk	Aug. 27	14	Croydon A 10 p. c.	315—320	..	4 7 6
163,400	„	„	11	Do. B 7 p. c.	252—257	..	4 5 7
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	137—140	..	3 15 0
60,000	„	„	5	Do. 5 p. c. Prf.	140—143	..	3 9 11
486,090	10	Jan. 29	11	European, Ltd.	25½—26½*	−½	4 3 0
354,060	10	„	11	Do. £7 10s. paid	18—19	−½	4 6 0
6,922,110	Stk.	Aug. 12	12½	Gaslight & Coke, A, Ord.	314—317	−1	4 0 6
100,000	„	„	4	Do. B, 4 p. c. max.	113—118	..	3 7 10
665,000	„	„	10	Do. C, D, E, 10 p. c. Prf.	320—325	..	3 1 6
30,000	„	„	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	„	„	7½	Do. G, 7½ p. c. do.	222—227	..	3 6 1
1,300,000	„	„	7	Do. H, 7 p. c. max.	204—209	..	3 7 0
463,000	„	„	10	Do. J, 10 p. c. Prf.	319—324	..	3 1 8
476,000	„	„	6	Do. K, 6 p. c. Prf.	187—192	+2	3 2 6
1,061,150	„	Dec. 15	4	Do. 4 p. c. Db. Stk.	138—141	..	2 16 9
294,850	„	„	4½	Do. 4½ p. c. do.	156—159	+1	2 6 7
958,000	„	„	6	Do. 6 p. c. do.	205—210	..	2 17 1
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental	217—222	+1	4 10 1
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99—102	..	3 18 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk. „	104—107	..	3 5 5
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	Dec. 15	6	Malta & Medn., Ltd.	5½—6	..	5 0 0
560,000	100	Oct. 1	5	Met. of Melbourne 5 p. c. Db.	112—114	..	4 7 8
250,000	100	„	4½	Do. 4½ p. c. Db.	109—111	..	4 1 1
541,920	20	Nov. 11	5	Monte Video, Ltd.	15—16	..	6 5 0
150,000	5	Nov. 26	8	Oriental, Ltd.	8¼—8¾	..	4 11 5
135,000	5	„	8	Do. New, £4 10s. pd.	7—7½	..	4 16 0
15,000	5	„	8	Do. do. 1879, £1 pd.	1½—2	..	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.	4½—5	..	7 0 0
420,000	100	Nov. 2	6	People's Gas 1st M. Bd.	104—109	..	5 10 1
500,000	100	Dec. 1	6	of Chicago 2nd do.	103—108	..	5 11 1
250,000	10	Sep. 30	10	San Paulo, Ltd.	16—17	..	5 17 3
135,000	Stk.	—	10	Sheffield A.	250—253	..	3 19 0
209,053	„	—	10	Do. B.	250—253	..	3 19 0
447,427	„	—	10	Do. C.	250—253	..	3 19 0
5,475,000	Stk.	Aug. 12	5½	South Metrop., 4 p.c Ord	145—148	+1	3 10 1
1,416,667	„	Jan. 13	3	Do. 3 p. c. Db. Stk.	105—108*	..	2 15 7
60,000	Stk.	Sep. 15	12	Tottenham and Edmonton A.	285—295	..	4 1 4
60,000	„	„	9	Do. B.	205—215	..	4 3 9
182,380	10	Dec. 30	7	Tuscan, Ltd.	13¾—14½	..	4 16 7
149,900	10	Jan. 3	5	Do. 5 p. c. Dbs. Red.	100—103	..	4 17 1
				WATER COMPANIES.			
746,164	Stk.	Dec. 30	10½	Chelsea, Ord.	335—340	..	3 1 9
150,000	„	„	5	Do. 5 p. c. Prf.	177—180	..	2 15 6
160,000	„	„	4½	Do. 4½ p. c. Pf. Stk., 1875	157—160	..	2 16 3
175,785	„	Sep. 30	4½	Do. 4½ p. c. 1 b. Stk.	160—165	..	2 14 6
1,720,560	Stk.	Oct. 14	7½	East London, Ord.	233—237	..	3 3 3
654,740	„	Dec. 30	4½	Do. 4½ p. c. Db. Stk.	162—165	..	2 14 6
390,000	„	„	3	Do. 3 p. c. Db. Stk.	105—107	..	2 16 1
700,000	50	Dec. 15	7½	G'd Junct'n, 10 p. c. max.	122—127	..	2 19 0
295,000	Stk.	„	4	Do. 4 p. c. Db. Stk.	147—152	..	2 12 8
708,000	Stk.	Aug. 12	13	Kent	362—367	..	3 10 10
160,000	„	„	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	Dec. 30	10	Lambeth, 10 p. c. max.	307—312	..	3 4 1
406,200	100	„	7½	Do. 7½ p. c. max.	227—232	..	3 4 8
850,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147—150	..	2 13 4
500,000	100	Aug. 12	13	New River, New Shares	452—457	..	2 16 10
1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.	151—154	−1	2 11 11
902,300	Stk.	Dec. 15	6	Southw'k & V'xhall, Ord.	165—168	..	3 11 5
126,500	100	„	6	Do. do. 7½ p. c. max.	157—162	..	3 14 1
489,200	Stk.	„	5	Do. do. 5 p. c. Prf.	175—180	..	2 15 6
1,019,585	„	Oct. 14	4	Do. 4 p. c. A Db. Stk.	146—149	..	2 13 8
1,155,066	Stk.	Dec. 15	10	West Middlesex	317—322	..	3 2 1
200,000	„	„	4½	Do. 4½ p. c. Db. Stk.	162—165	..	2 14 7
				* Ex div.			

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Monday's meeting of the Edinburgh and Leith Gas Commission was of considerable importance. They first took up the subject of public lighting, which, in the words of Bailie Kinloch Anderson, has undergone a change since electric lighting has come in. The Corporation are now very large contributors to the companion light. No town in Scotland approaches to anything like Edinburgh in the matter of public electric lighting. They have 515 lamps in use; and I see that this week the Town Council have resolved to erect other 91 lamps. Further, the price per lamp is to be reduced from £16 to £15 a year. The Corporation already pay more for electricity than they do for gas for public lighting. In the half year ending Nov. 15, the charge for gas was £3413; and for electricity, £3809. But this is wandering away from the Gas Commission. The point raised was that so many of the largest gas consumers having taken to electricity, it would be unfair to supply gas for public lighting at less than cost price, because it would be making the poorer classes of gas consumers pay more than their share for public lighting. This would be an inequitable arrangement; but it is one which exists in connection with the public electric lighting. With reference to it, the poorer districts of the city contribute to the lighting of the richer; and they do so in a proportion much larger than would the gas consumers, had the price of gas remained at 2s. 1½d. per 1000 cubic feet. I pause here again to point out that the City of Edinburgh, in paying about £8000 a year for public electric lighting, contributes more to the revenue of the Electric Lighting Department than is required to meet the interest upon the capital of about £250,000. And when it is considered that all the public offices, down even to the police cells, are lighted by electricity, it comes to this—that the Corporation themselves contribute not greatly short of what is necessary for the interest and the re-payment of capital. This is a convenient form of financing the department. Coming back to the Gas Commission, it must almost be with a feeling of surprise that one learns there was opposition to the proposal to raise the price of gas to 2s. 5d. per 1000 cubic feet. Some, it is true, thought it should be more, and proposed 2s. 6d.; while others—not, however, going the length of moving—considered that it should be less. Ultimately, on a division, 2s. 5d. per 1000 cubic feet was adopted.

Then the Commissioners had before them the oft-recurring subject of carburetted water gas, and particularly Mr. Herring's report to them, on the subject, which is given in another column (see p. 234). Mr. Herring's report is lucidity itself, and requires no comment or explanation. It is remarkable in that it clears up all that was obscure in the matter of the working of the carburetted water-gas plant. Those gas consumers who were lashing their sides, now know that it was not the Gas Commissioners who were sending out carburetted water gas, but that it was Messrs. Humphreys and Glasgow, the contractors for the erection of the plant, in testing it. While this is so, and the Commissioners are saved the odium of having begun to supply the new gas surreptitiously, there is but a paper wall between what they did and what they were suspected of doing. Another point which was made clear was that the Public Health Committee of the Corporation are still investigating the question of the poisonous nature of carburetted water gas. More may thus be heard of it. Leaving the region of fact, and entering the domain of conjecture, I confess that I cannot resist the conclusion that the feeling is arising in the Commission: "Now we have got the plant, what are we to do with it?" Mr. Herring recommends that, in the meantime, it should be worked only a few hours a day, to keep it in proper order; and Bailie Kinloch Anderson takes the same view. This is somewhat peculiar, because we have been told all along, by everybody interested, that the carburetted water-gas process is an excellent stand-by. Now it appears that it must be worked two or three hours a day, to keep it in order. Surely this will be expensive. Will the whole plant be kept hanging for, say, 20 out of the 24 hours? and, if so, at what cost? Or will it be allowed to cool down, and then be re-heated every day? and, if so, at what cost? It seems to me that the Commissioners are now finding out what they should have considered before they entered upon the undertaking, and that they have put in too large a plant. A small installation, working continuously, would be more economical. From whatever cause, I think it is apparent that there is not the same enthusiasm in the Commission over the introduction of carburetted water gas as there was more than a year ago.

It is just possible that we may have litigation over the contribution made by the Edinburgh and Leith Gas Commissioners to the Diamond Jubilee Fund of the Edinburgh Corporation. The matter, first brought forward on behalf of an anonymous person, has now been placed in the hands of Messrs. Davidson and Syme, who wrote to the Commission asking under what authority the contribution was made. Messrs. Davidson and Syme have experience in gas-works management, for they were the Law Agents of the Edinburgh Gaslight Company. The reply of the Clerk was that he had advised the Commissioners that, in his opinion, the contribution might be given. Their Act of Parliament said: "The rents, rates, and charges levied under the authority of this Act, and the other revenues of the Commissioners, shall be applicable in the manner and in the order following: (2) In payment of the expenses of managing and maintaining the undertaking of the Commissioners." Their workmen, he said, got the benefit of the Royal Infirmary, which was to be assisted by the Jubilee Fund; and they might, he thought, provide their own medical attendance, for which they would have to pay heavily, so they might subscribe to the funds of the Infirmary. The point is a narrow one; but I incline to the belief that the Clerk is right. At least, I think it unlikely his view would be upset, if it were taken into Court.

The Commissioners have done an exceedingly sensible thing in sending Mr. Herring to England and to the Continent, to see the latest appliances in gas-works. Mr. Herring is to be accompanied by Mr. Corbet Woodall. The two gentlemen will see more, and be able to bring back more information, than would the entire Gas Commission. But a trip to the Continent is very tempting; and I almost wonder that someone did not want to go with them.

Mr. D. Bruce Peebles, of Edinburgh, on Monday night, made a communication on "Acetylene Gas" to a meeting of the Royal Scottish Society

THE "CZARINA"

(With PROJECTING FIRE.)

No. of Stove	B 3047	B 3048	B 3049
Width of Fire	8½ in.	10 in.	13 in.
PRICE . .	45s.	55s.	65s.

GAS-FIRE SEASON 1897-98

BEFORE ORDERING, SEE OUR

NEW DESIGNS.

UNEQUALLED,

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The Oldest and Largest Gas-Stove Makers in the World.

of Arts. Mr. Peebles illustrated his remarks by some experiments carried out by means of a generator which he has invented. This generator, he said, he would have patented, but for the curious reason that so many patents are being taken out for the production of acetylene gas. He is quite willing that anyone should have the benefit of it. In treating of the history of acetylene, Mr. Peebles mentioned that in 1839 Torrey noticed, in the copper pipes through which gas was at that time supplied in New York, a brownish substance—the acetylide of copper. It was very explosive on a slight rise of temperature, or when subjected to shocks. This phenomenon must have been known in Edinburgh before that time, for the late Mr. John Milne informed him that his father, Mr. James Milne, had been much puzzled by explosions in gas-pipes, in the most unaccountable manner; and that it was discovered that acetylide of copper was the cause. No doubt this must have led to his commencing the manufacture of block tin or composition tubes, which removed all danger, as acetylene has no action upon tin. Mr. James Milne was the inventor of the block tin tubes, which are now in use all over the world. The Peebles generator is on lines which, he admitted, were common to nearly all machines of the kind; but he claimed to have made a very simple apparatus for opening and closing the water supply. This apparatus is worked by the rise or fall of the gasholder; and Mr. Peebles pointed out that a number of small generators (or retorts, as he said they might be called) could be placed round the generator, at different levels, and by this automatic appliance, they would work off in succession—the one taking up the supply when the other was exhausted. The little apparatus seemed to work very effectively; keeping the gasholder, off and on, about one level. Twenty-four gas-jets were maintained burning by the generator; and the light they gave was sufficient, with the aid of a reflector, to enable two photographs to be taken, the exposures given being 20 and 30 seconds respectively. The resultant photographs were not exhibited, because of the difficulties of development at that time and place. But specimens of others which had been taken previously were handed round; and they were in every way quite satisfactory. A short discussion followed, which was noticeable for one or two things. In the first place, a gentleman expressed himself as sorry that some of the Gas Commissioners were not present, because the gas supplied in Edinburgh now gave much less light, and made more smell than it used to do. If, he thought, gas like that shown were introduced into private houses, it would give great satisfaction. He would like to knew if, by the use of this gas, or any other kind, the gas supply to the city of Edinburgh could be made usable. Another gentleman replied that Edinburgh gas was too good, but that people did not know how to use it. He also stated that, burnt at the rate of 5 cubic feet per hour, acetylene gas gave a light of 240 candles, which was ten times the illuminating power of Edinburgh gas. To obtain from Edinburgh gas the same light as they secured from 5 cubic feet of acetylene gas, they would require to use 50 cubic feet. A pound of carbide of calcium would give them 5 cubic feet. The price of it would be about 2d.; and 50 cubic feet of coal gas, at 2d., just worked out to 3s. 4d. per 1000 cubic feet, which was the price at which Edinburgh gas was sold some years ago.

The "Dundee Advertiser" of last Saturday contains the following, under the heading of Stirling:—

LOCKED OUT.—A special meeting of the Town Council was called for yesterday afternoon to adopt a resolution to oppose the Gas Company's Bill, similar to the resolution adopted by the Council sitting as Burgh Commissioners. The representatives of the Press, though asked to attend, were informed that the proceedings would be conducted in Committee. Ex-Provost Kinross, a councillor interested in the Gas Company, though Convener, was denied admittance to the meeting; and it is understood the Burgh Officer was instructed to refuse admittance to Mr. Farlane M'Farlane, also another councillor who is a shareholder in the Company.

This ugly bit of news has now been contradicted; and therefore one may assume it to be true. The suggestion is made, in a Stirling newspaper to-day, that the reason for the secrecy is that it is proposed to make the Common Good of the burgh bear the cost of opposing the Gas Bill. The Common Good is in the custody of the Town Council, which is the cause of their being called into the matter. The desire for secrecy arises from the fact that the present majority of the Town Council roundly abused the majority of the last Council for taking the expenses of the proposed transfer out of the Common Good. If the report be true, the whirligig of time has brought in its revenge very promptly.

The Works Committee of the Perth Gas Commission on Monday opened tenders received for the erection of new buildings for the gas-works at Friarton, and remitted them to a Special Sub-Committee for examination and report. At the same time, they considered the following report by Mr. J. Hepworth, of Edinburgh, on the plans which have been prepared by Mr. A. Wilson, the Engineer: "The plans of the buildings are well adapted for the purpose they are intended to serve; and they are well designed and substantial in character. The area of the site on which the works are to be erected is stated at about 4½ acres; and this would be sufficient for the manufacture of 3 million cubic feet per day. The site is well provided with railway accommodation for dealing with coal and residual products. I am informed that it is proposed to introduce the electric light in Perth; but notwithstanding this, there should be no difficulty in developing the consumption of gas to such an extent as to amount to an increase of 5 per cent. per annum. I am not sure that my opinion is sought as to the cost of the new works; but I have obtained from Mr. Wilson an estimate of the cost, which I find amounts to £52,400. This estimate I do not regard as excessive; nor should the cost of the building of the works as now designed exceed this amount, provided the specifications are well considered." The Committee considered the report to be very satisfactory. On Thursday night the Town Council of Perth held a special meeting, to consider the adoption of the Local Authorities Loans (Scotland) Acts, 1891 and 1893. The purpose which the Council have in adopting the statute is in order that they may create redeemable Corporation Stock, to an amount not exceeding £327,000. Of this sum, £52,500 is required for the erection of new gas-works. All the debts of the public bodies are to be extinguished as they exist, and made payable out of stock. It is proposed to pay 2½ per cent. This method of dealing with Corporation indebtedness is becoming exceedingly common. It is, of course, a much cheaper way of raising money than mortgages.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

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AMERICA.

TORONTO	One New Set.
OTTAWA	One New Set.
TORONTO	(Second Contract) Improving Four Double Superheater Settings.
LINDSAY	Re-modelling Plant.
MONTREAL	Two New Sets and other parts of Plant.
BELLEVILLE	One "Springer" Setting Re-modelled with M-W-P. Patents.
OTTAWA	(Second Contract) One New Set.
BRANTFORD	Additional Improvements to Existing Setting.
ST. CATHERINES	Additional Improvements to Existing Setting.
KINGSTON, PA.	One New Set and other Parts of Works, including New Purifiers and Gasholder.
PETERBOROUGH	One Set and Re-modelling Works.
WILKESBARRE, PA.	Two New Sets and other parts of Plant.
ST. CATHERINES	(Second Contract) One New Set.
BRANTFORD	(Second Contract) One New Gasholder.

ENGLAND.

	Daily Capacity. Cubic Feet.
BLACKBURN	1,250,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Company)	120,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000

At the last meeting of the Greenock Gas Trust, Mr. Mitchell, the Convener, in moving the adoption of the minutes, said that during the six months closing with December last the total quantity of gas consumed showed an increase of nearly 5 million cubic feet on the consumption in the corresponding six months of the previous year. In the minutes it was stated that the Sub-Committee on Connection of Gas Cookers agreed to recommend that the department should now undertake the work of laying on piping, and make the necessary connections for gas cookers when being hired out, charging the consumer 10 per cent. on the cost of the gas-fitting required in each case, in addition to the hire of the cookers. The minutes were passed.

The community of the recently-created burgh of Monifieth, near Dundee, have "blown cold" upon the proposal of the Police Commissioners to adopt the Burghs Gas Supply Act. The Act had been adopted by the Police Commission in regular form; the final approval having been given at the first meeting of the Commission after the November election. The intention of the Police Commission was to erect new gas-works for the supply of the burgh. It must have been with considerable chagrin that the party promoting the movement found that the opposition had lodged a remonstrance against the adoption of the Act, signed by twenty ratepayers, as required by the statute. This necessitated a poll of the ratepayers being taken, which was done on Tuesday. Of 561 persons on the roll, only 283 voted; and of these 155 were against the adoption of the Act, and 128 in favour of it. The rejection of the measure came as a surprise. It was known that there was opposition; but till quite lately it was of a mild type. It would seem to be doubtful wisdom to insert in such statutes a provision allowing the voice of the people to be taken, as it is so easily influenced by uninformed opinions.

The "North British Daily Mail," in its column of "Glasgow Commercial Notes," yesterday, said: "The speculation in sulphate of ammonia continues; and though the price is nominally £10 2s. 6d. per ton, some profess that they are getting more. The purchasing at the moment is purely speculative, though be it said that the Scotch oil companies, not having sold much ahead, are sharing in the spoil. Speculators are calculating upon getting relieved of their holding when the spring demand commences; but as sulphate is expensive to store, and dries in the keeping, should consumers not come forward the venturesome speculators may find their profits on paper greatly curtailed." To-day the same paper says that the price rose yesterday to £10 7s. 6d. per ton.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 29.

Sulphate of Ammonia.—There has been an active market throughout the week; and within the past few days, the demand for ready parcels has been exceptionally keen—the closing quotations being £10 2s. 6d. to £10 5s. per ton f.o.b. at the ports. There is still some disposition on the part of consumers to postpone purchasing; and the most is being made of cheap nitrate of soda. But, notwithstanding this, exports for January show an increase over those of January, 1897, indicating that in the main consumers have accepted the inevitable, and are covering their requirements accordingly. There has also been improvement in the forward position; £9 17s. 6d. per ton having been paid f.o.b. Leith for May-October delivery. For February-June, £10 2s. 6d. per ton f.o.b. Leith is now required; while Beckton make has been withdrawn from the market altogether for the present.

Nitrate of Soda still hangs fire; but if the weather remains open, a large demand may be looked for in February, and some improvement in prices. Meantime, the quotations remain, on spot, 7s. 6d. per cwt. for good, up to 7s. 7½d. per cwt. for fine, quality.

LONDON, *Jan.* 29.

Tar Products.—The anomalous position of some of the lighter coal-tar products has completely upset the old-standing arrangements for dealing with the crude form of them. For instance, both solvent and heavy naphthas are of more value than benzols—a true case of "the tail wagging the body." The practical effect of this is that midland and west-coast crude naphthas containing more solvent and burning naphthas are worth more money than (say) the east coast and suchlike crude naphthas, which contain a smaller quantity of these products, and the benzols in them are chiefly of the 90's quality. A distinctly better feeling is noticeable in pitch. Somewhat higher prices are being offered; and makers are doubtless now preparing to lay in stocks for the summer work, in view of a better condition of trade, which will probably follow the settlement of the disastrous dispute of the last eight months. Carbolic acid is firm; and benzols are saleable at a slightly better price. There are more buyers of both qualities of benzols; and the prospect is now more hopeful. Creosote and heavy oils are moving off pretty freely; and prices are being well maintained.

The average quotations for the week are as follows: Tar, 12s. 6d. to 16s. 6d. Pitch, east coast, 18s. 6d; west coast, 15s. 6d. Benzol, 90's, 1s. 3½d.; 50's, 1s. 5½d. Toluol, 1s. 8½d. Solvent naphtha, 1s. 6½d. Crude, 30 per cent., naphtha, 7d. to 8d. Creosote, 2¼d.; liquid, 2½d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 2s. Naphthalene, 55s.; salts, 30s. Anthracene, "A," 5½d.; "B," 4½d.

Sulphate of Ammonia.—The week has been marked by a steady market, with a large business doing in all positions at prices ranging between £10 2s. 6d. and £10 5s., less 3¼ per cent. The market was never in a healthier or sounder position than it is at present. This is largely due to the satisfactory unobtrusive work of the Sulphate of Ammonia Committee, who have cleared away the serious misunderstandings that existed in respect of stocks. The Committee (as will be seen by an article in another part of the "JOURNAL") is just now issuing important and extremely interesting literature on the value of sulphate of ammonia as a manure, which will not only be useful to buyers, but will doubtless have a good influence on the market value of the article.

Kirkby Water Supply.—The Kirkby District Council have decided to apply to the Local Government Board for sanction to borrow £9200, in order to carry out a water scheme which has been planned by Messrs. Radford, of Nottingham.

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COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The settlement of the engineering dispute necessarily gives a more hopeful outlook to the coal trade. The better qualities of round coal still hang on the market, owing to the exceptional mildness of the season; and for these prices here and there show some slight easing down. But in other descriptions of fuel, suitable for iron-making, steam, and general manufacturing requirements, the position is fairly satisfactory. Common round coals are in tolerably good request; and for these prices are steady at recent rates. Colliery proprietors generally have no difficulty in moving off all their output of engine fuel—the present restricted production of slack being in some cases short of requirements; and prices are firm at full late rates. In the shipping trade, a good weight of business is coming forward; and notwithstanding rather plentiful supplies of round coal, this is keeping up prices. The average quotations are much the same as last week. Best Wigan Arley remains at 10s. 6d. to 11s. per ton at the pit; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; common house coal, 7s. to 7s. 6d.; steam and forge coal, 6s. 6d. to 6s. 9d.; best slack, 4s. 6d. to 5s.; medium, 3s. 9d. to 4s. 3d.; and common, 3s. 3d. to 3s. 6d. Shipping prices are about 8s. 3d. to 8s. 6d. per ton for good qualities of steam coal, delivered at the ports. Except that here and there perhaps 3d. per ton might be taken under the prices quoted for the better qualities of round coal, list rates, taking them all through, are firm on the above basis.

Northern Coal Trade.—There has been a falling off in the demand for coal; and prices are now easier than they have been this year. Best Northumbrian steam coal is in better demand than usual at this season; but the output is now very full, and the price is down to about 8s. 3d. per ton f.o.b. Second qualities of steam coal are quoted at 7s. 9d. per ton; and steam smalls at 3s. In the gas coal trade, there has been much interest shown over the question of the contracts for the coal for Copenhagen. The tenders were on the basis of from 11s. 6d. to 12s. 3d. per ton delivered; and it is believed that the order has been divided among four collieries—two shipping at Sunderland, one at West Hartlepool, and the other one on the Tyne. The quantities are 40,000 tons each for the first two, 20,000 tons to the third, and 10,000 tons for the last-named. The price, allowing the usual freight, will yield from 7s. 6d. to 8s. per ton f.o.b. This is probably 6d. per ton more than was received under last year's contracts. It is expected that this advance in the price of gas coals will influence many other contracts yet to be entered into. There is no alteration in the price of gas coke this week.

Scotch Coal Trade.—Trade remains good; and, with the settlement of labour troubles, it may be expected to improve. For ell, higher prices are already being offered for forward delivery; but there is an indisposition to come to terms. A rise in prices may be looked for soon. The rates quoted are: Main, 6s. 6d. to 6s. 9d. per ton f.o.b. Glasgow; ell, 7s. 1½d. to 7s. 4½d.; splint, 7s. 3d. to 7s. 6d. The shipments for the week amounted to 148,731 tons—an increase upon the preceding week of 14,672 tons, and upon the corresponding week of last year of 5864 tons. For the year to date, the total shipments have been 376,886 tons—an increase upon the same period of last year of 12,576 tons.

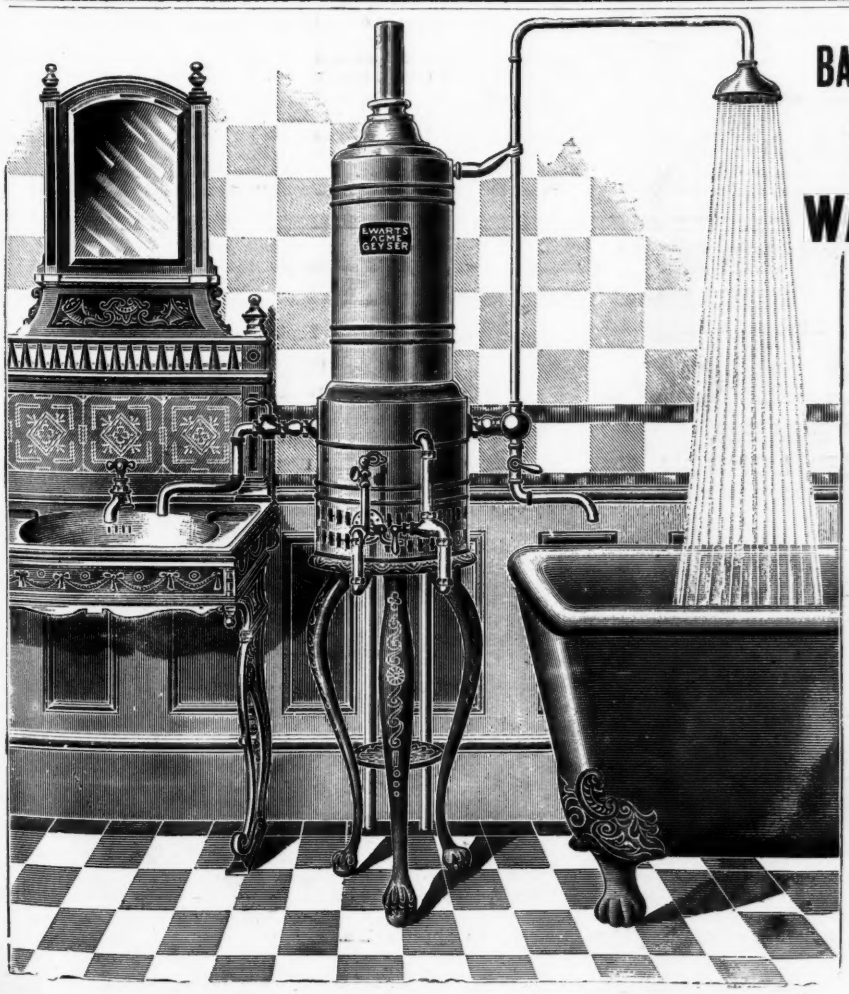
The Use of Prepayment Gas-Meters in Birmingham.—The Gas Committee of the Birmingham Corporation report that upwards of 3000 prepayment gas-meters have now been fixed, and that there are, in addition, more than 600 orders now on hand waiting execution.

Proposed Transfer of the Gomersal Water-Works to the District Council.—The Gomersal Urban District Council have retained the services of Mr. J. Waugh, of Leeds, and Mr. Thomas Newbigging in the matter of the transfer of the Gomersal Water Company's undertaking to the Council.

Leicester Corporation Gas and Electric Light Undertakings.—The Gas and Electric Lighting Committee of the Leicester Corporation report, in regard to the manufacturing operations, that during the past half year the amount of coal used for gas making was 71,898 tons. The quantity of gas made was 729,888,000 cubic feet, as against 710,188,000 cubic feet in the corresponding period of the previous year; being an increase of 19,700,000 cubic feet, or 2·77 per cent. The total output of electric current from the central station for the half year was 204,084 units; and the number of consumers was 350.

Rural District Councils and the Purchase of Gas and Water Works.—At the meeting of the Isle of Wight Rural District Council last Thursday, the General Purposes Committee recommended the Council to make an offer to the Official Receiver of the Brading Harbour Company to purchase the gas and water works, subject to the approval of the Local Government Board being obtained. As power was only conferred on urban authorities to acquire gas-works under section 162 of the Public Health Act, the Clerk (Mr. F. Stratton) wrote to the Local Government Board on the point. In reply, a communication was received saying that there was no instance where a Rural District Council were invested with powers under the section referred to; and they (the Board) were not aware of any sufficient reasons to justify them in conferring powers in the present case. Nevertheless, the Council adopted the recommendation.

York United Gaslight Company.—The Directors of this Company report that for the half year ending Dec. 31 the balance of revenue carried to profit and loss amounts to £4658; and the interest from the reserve investment fund to £242—making a total profit of £4901. Of this £293 has been utilized in paying the half-year's interest upon money borrowed on mortgage; leaving £4608 available for dividend. The latter amount falls short of the sum required by £2391; but as the deficiency can be taken from the surplus profits of previous years, the Directors recommend the usual dividend of 5s. per share upon both the old and new shares. To meet the growing demands for gas in the Bootham and Clifton districts, the Directors have during the half year laid a special supplementary main; and the growth of other districts will, in the near future, have to be similarly met. The weather during the six months has been exceptionally mild, yet foggy and dark; and therefore the gas consumption has been fairly maintained—the increase averaging over 4 per cent. The amount of capital authorized by Parliament having been expended, the Directors will, at the close of the ordinary meeting of the shareholders, submit a scheme for promoting a Bill in Parliament during the coming session. To fill the vacancy caused by the death of Mr. T. P. Bulmer, Vice-Chairman, the Directors have appointed Mr. E. T. Wilkinson.



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The Assessment of the York Gas-Works.—The Assessment Committee of the York Union have consented to hear the appeal of the York Gas Company against their assessment, which has recently been raised. Mr. T. Newbigging will appear on behalf of the Company.

Wallasey Gas-Works Extensions.—The Clerk of the Wallasey District Council (Mr. H. W. Cook) has received the sanction of the Local Government Board to the borrowing of £8000 for gas-works purpose, and also a draft Provisional Order for power to borrow £40,000 for the same department.

The Proposed Transfer of the Fylde Water-Works.—The Fylde Water Company having fixed the value of their undertaking at £1,422,891, the Joint Board representing the Local Authorities who are negotiating to purchase have served notice that arbitration will be adopted to determine the price to be paid.

The Public Lighting of Douglas.—The Lighting Committee of the Douglas Corporation have considered tenders of the Douglas Gaslight Company and the Isle of Man Tramways and Electric Power Company to light the town respectively by gas and electricity, and have decided to recommend the acceptance of the Gas Company's tender, with power to terminate the agreement at any time so far as the sea front is concerned. The Company offered to light the town with Welsbach burners at various prices per burner; while the Tramways Company were willing to supply the current only for electric lighting at 3½d. per Board of Trade unit.

Mill Lighting by Acetylene.—At Westbrook Mills, Bradford, an installation of acetylene gas has been fitted up. It consists of a main iron cylinder 5 feet high and 2 ft. 6 ins. in diameter, with a small cylinder about 2 feet high on either side. The larger structure acts as a gasholder and as a reservoir for water, and the two small cylinders are the actual generators. The installation is an experimental one, and is only being used at present for lights. The old gas-fittings have been utilized; the only change being that small burners adapted for acetylene have been substituted for the ordinary ones. It will be interesting to ascertain from the experiment how the cost compares with electricity and coal gas. On this point, of course, an extended trial is necessary before reliable data can be forthcoming.

Chichester Water-Works Transfer.—The Chichester City Council last Wednesday, signed an order on the Treasurer for the payment of accounts for the settlement of the transfer of the water-works from the Company to the Corporation, and also of all expenses relating to the transaction. The amount payable to the Company was £51,650 15s. 7d., for which a cheque was drawn by the Treasurer and handed over to the Directors of the Company. Other charges and costs in connection with the transfer made the total sum £53,017 13s. 11d. On the recommendation of the Finance Committee, it was decided to place the water-works under the superintendence of Alderman Smith until the appointment of a new Surveyor; and pending further arrangements, if necessary, it was resolved to assign the management of the works to the General Purposes Committee.

Faringdon Water Supply.—Colonel Slacke, R.E., recently held an inquiry at Faringdon, on behalf of the Local Government Board, into a proposal of the District Council to borrow £4000 for carrying out a scheme for supplying the town with water. Colonel Edwards, the Chairman of the Council, said they had been considering the question since 1894. A Committee was formed in 1895, and, with the assistance of a water diviner, a site was fixed upon, where, on reaching a depth of 50 feet, they found a supply of something like 56,000 gallons of water per day. The water was analyzed, and found to be pure. Mr. Winship, the Engineer, said water could be obtained at the present site at the rate of 20 gallons daily per head of the population; and there was no danger of the supply becoming polluted. He recommended a windmill for providing the motive power, the maintenance of which would, he said, only be £15 per annum, while an engine with attendant would cost £75.

Water-Works for Sierra Leone.—Mr. H. B. H. Chapman, Director of Public Works at Lagos, has gone to Sierra Leone to report upon the water supply of that Colony. It is proposed to construct water-works at a cost of £30,000. They will be the first erected in any British colony on the west coast of Africa.

The Newcastle and Gateshead Gas Company and the Corporation's Land.—An arbitration to ascertain the price to be paid by the Newcastle-upon-Tyne and Gateshead Gas Company for certain lands belonging to the Corporation of Newcastle commences to-day at Newcastle before Mr. Oakley, of Westminster, as Umpire. Mr. Doig Gibb, Engineer of the Company, and Mr. T. Newbigging will give evidence.

Water-Works for the Evesham Rural District.—By direction of the Local Government Board, Mr. W. O. E. Meade-King held an inquiry last Wednesday into an application of the Evesham and Pebworth districts for sanction to borrow an additional loan of £3000 for works of water supply to the villages of Bretforton, Church Honeybourne, Cleeve Prior, North, Middle and South Littleton, Sedgeberrow, Aston Somerville, Hinton, and Pebworth. There was no opposition to the application. It was explained that originally a loan of £12,232 was borrowed; but the estimate had been largely exceeded, owing chiefly to increased prices and the addition of work not at first contemplated.

The First Village Electrically Lighted.—The claim put forward by the Parish Council of Treeton, in Yorkshire, to be the first to adopt electric lighting, as noticed in the "JOURNAL" last week, has been much disputed. It is stated that since August, 1895, the village of Ure Bank, near Ripon, has been lighted by a firm in that city for the Parish Council at a cost to the ratepayers of 2d. in the pound. An 8-candle light is supplied to the artisans' dwellings at 3½d. per light per week, and 3d. if more than one in any single house; the undertakers finding and fixing all material, and renewing lamps when necessary. The supply is practically confined to the streets and artisans' dwellings; the middle-class residents holding aloof.

Folkestone Water Bills and the Water Supply of Dover.—The Dover Corporation have consulted an expert Water Engineer in regard to certain of the proposals contained in the Folkestone Water Company's Bill, and their possible effect on the water supply of Dover. The Engineer is of opinion that the sinking of a well on any one of the areas intended to be acquired by the Folkestone Company, and the abstracting of water therefrom, would materially interfere with the flow of water in the River Dour, and also with the underground waters at present contributing to the water supply of Dover. The Council have therefore decided to oppose the Bill; and as it is probable that it may be referred to the same Parliamentary Committee as that promoted by the Folkestone Corporation, and the two measures amalgamated, they have also resolved to take the requisite steps for being heard against the Corporation Bill.

As will be seen by an announcement in our advertisement pages, "Holophane Limited" have made large reductions—ranging from 25 to 50 per cent.—in the prices of their patent globes. The usefulness of these globes as light diffusers is widely recognized; and this diminution in cost will no doubt secure for them a greatly extended adoption.

The Glasgow Corporation Gas Committee, after testing a sample lot of 10-inch pipes, and finding them to be satisfactory, have agreed to recommend the acceptance of a tender by Messrs. R. D. Wood and Co., of Philadelphia, for the supply of pipes of that size for a period of twelve months. The price is said to be considerably less than the pipes were offered at by any firm in this country.

The Secretary of State for Foreign Affairs has received a despatch from Her Majesty's Minister at Tangier, stating that tenders have been requested by the Hygienic Commission for the supply of drinking water to Tangier. They are to be delivered to the President of the Hygienic Commission before July 31. Particulars can be seen on application to the Commercial Department of the Foreign Office.

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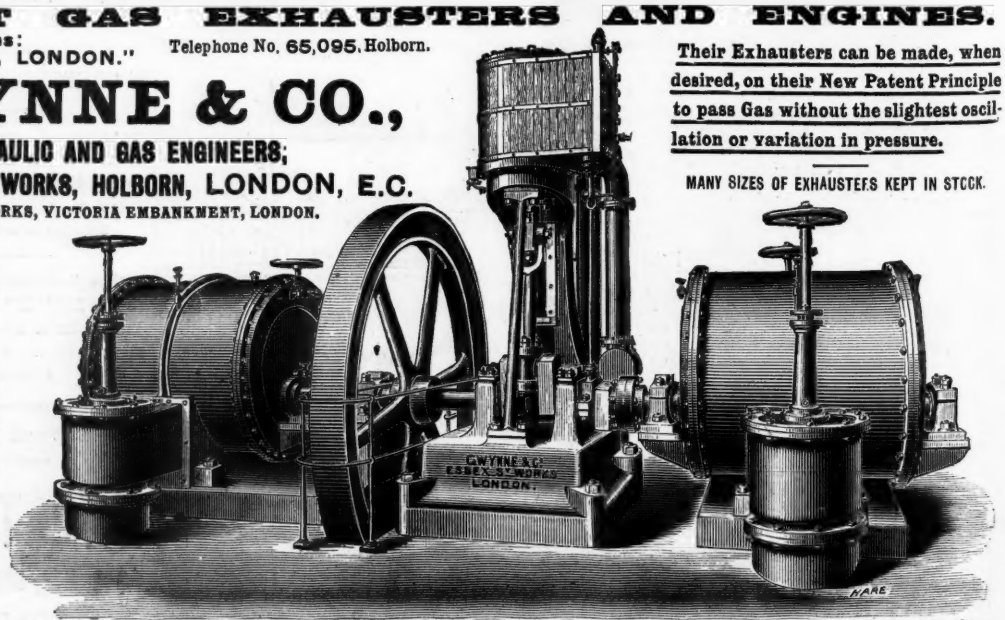

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

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JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see p. 252.]

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

IMPORTANT.

OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed.
CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

APPLICANTS for the post of Meter INSPECTOR to a Gas Company on the South Coast are thanked, and informed that the VACANCY HAS NOW BEEN FILLED UP, and that many of them possessed Qualifications much beyond what was required for the position.

SITUATION wanted as Working MANAGER of small Gas-Works. Has held present Situation upwards of fifteen years. Can set Retorts, and take Meters.
S. GOODALL, Gas-Works, Bishop's Waltham, HANTS.

WANTED, an appointment by an ENGINEER experienced in the design and erection of Gas-Works, and general Engineering, either on large Extensions to Works or as AGENT to a Firm of Contractors.
Address C. E., 141, Walton Street, OXFORD.

SCOTSMAN, certificated in all Mechanical subjects, good Draughtsman, and with excellent Experience in Gas Engineering Contractors' Works and large Provincial Gas-Works Practice, is willing to act as LONDON and DISTRICT REPRESENTATIVE for good Firms connected with the Gas Industry.
Address No. 2992, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a competent Gas-Fitter, with experience in Main and Service laying. Permanent Situation to good steady man. Wages 28s. per week.
Applications and References to Mr. G. S. FRITH, Gas Office, FRODSHAM.

WANTED, an experienced Main and SERVICE LAYER. One capable of Erection of all Gas-Works Plant. Permanent Engagement to a steady and competent Workman.
State (by letter) References and Wages expected to No. 2987, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Gas-Works near London, a BLACKSMITH and MAINLAYER. To a Man competent to keep Engines, Boilers, and Retort-House Plant in good working order, fair Wages will be paid.
Apply, by letter, to No. 2994, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a small Gas-Works in the Midlands. A constant Situation if suitable. One who can do a little Gas-Fitting preferred. Married. References as to good character necessary. Wages £1 per week, with House and Garden, Coal and Gas.
Apply, by letter, to No. 2993, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a competent Engineer and MANAGER for the Stamford and St. Martin's Gaslight and Coke Company.
Apply, by letter only, stating Age, with Testimonials, to the Chairman, on or before the 10th of February, 1898.
GEO. H. CHAPMAN,
Secretary.
Gas-Works, Stamford.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
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BROTHERTON AND CO., Chemical Manufacturers.
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GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

TO GAS AND WATER OFFICIALS.

SPECIALLY favourable terms for Cycles. First-Class Workmanship and Material guaranteed. Art Catalogue post free.
MELROSE CYCLE COMPANY, COVENTRY.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

WANTED, a good steady Man, used to Shovel Charging, Exhauster and Engine. Wages 27s. State whether Married or Single.
Apply to the MANAGER, Gas-Works, Ware, HERTS.

CORPORATION OF BURY.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive APPLICATIONS for the position of ENGINEER and GENERAL MANAGER of the Gas-Works and Tar-Plant. Annual make of Gas about 325 Million cubic feet. The Salary will commence at £350 per annum.
Applications, endorsed "Gas Manager," must be received by the undersigned, stating Age and Qualifications, not later than Monday, the 7th of February, 1898, and must be accompanied by *copies* of not more than three recent Testimonials.
A printed list of the duties may be obtained after Thursday, the 27th inst.
Canvassing members of the Corporation is strictly prohibited, and will disqualify candidates.
JOHN HASLAM,
Town Clerk.
Corporation Offices, Bury.

WANTED Carbon. State Price for 4-ton Lots, delivered at nearest Station.
Address No. 2960, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, second-hand, in good condition, ten 16-inch CIRCULAR MOUTHPIECES, with Lids, Screws, &c.
Price and Particulars to No. 2991, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.
Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day.
For further Particulars, apply to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

FOR SALE, Cheap—The undermentioned GAS PLANT:—

		Square. Ft. in.	Deep. Ft. in.		
2 PURIFIERS,	8	0	4 6	6-in.	Valves & Connections.
1 "	7	6	4 6	6 "	" "
2 "	5	0	4 0	4 "	" "
1 "	5	0	2 9	4 "	" "

C.I. SCRUBBER, 38ft. 6in. high, 6ft. dia., 14-in. "
CONDENSER, 4 inches diameter, Vertical Pipes.
EXHAUSTER (Gwynne's) 20,000 c.f. per hour 8-in. Valves
Apply to SAML. WHILE AND SONS, 60, QUEEN VICTORIA STREET, E.C.

THE Corporation of Middleton invite TENDERS for the supply and erection of Two New (30 ft. by 20 ft.) PURIFIERS at their Gas-Works.
Plans, Sections, &c., may be seen, and Specifications and General Conditions obtained, on application to Mr. Timothy Duxbury, Gas Engineer, at his Office, Gas-Works, Middleton, on or after Tuesday, the 1st of February.
Sealed Tenders, on Forms supplied, must be delivered at my Office, addressed to the Chairman of the Gas and Electric Lighting Committee, and endorsed "Purifiers," not later than the 16th day of February, 1898.
The Corporation do not bind themselves to accept the lowest or any tender.
FREDERICK ENTWISTLE,
Town Clerk.
Town Hall, Middleton,
Near Manchester, Jan. 24, 1898.

PURIFIERS FOR SALE.

THE Montrose Gaslight Company have FOR SALE four PURIFIERS, each 12 ft. by 8 ft. by 3 ft. deep, with four 8-inch and two 10-inch Four-Way Valves and Connections, three Tiers of Sieves in each Purifier, and Lifting Gear complete. All in good condition. Sides of Covers almost new.

For further Particulars, apply to the Manager, THOS. D. HALL.

URBAN DISTRICT COUNCIL OF PADIHAM.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the supply of RETORTS, FIRE-BRICKS, &c.

For Particulars, apply to the undersigned.

Tenders, endorsed "Tender for Retorts, &c.," and addressed to the Chairman of the Gas Committee, District Council Office, Padiham, must be sent in not later than Twelve o'clock at noon, on Wednesday, Feb. 9, 1898.

By order,
J. R. SMITH,
Clerk.

District Council Office,
Padiham, Jan. 28, 1898.

HEXHAM GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the construction of a BRICK and PUDDLE GASHOLDER TANK, 80 ft. diameter by 20 ft. deep, at their Works, Hexham.

Plans and Specifications may be seen at the Company's Office, Gas-Works, Hexham.

Tenders, endorsed "Gasholder Tank," to be forwarded to the undersigned not later than Feb. 8, 1898.

The Directors do not bind themselves to accept the lowest or any tender.

HERBERT LEES, Assoc.M.Inst.C.E.,
Engineer and Secretary.

Gas-Works, Hexham,
Jan. 22, 1898.

LEIGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

RETORTS, ETC.

THE Gas Committee of the Council are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Forms of Tender can be obtained from the Engineer, Mr. J. Foster, Gas-Works, Leigh.

Tenders, endorsed "Tender for Retorts," to be addressed and sent in to me, the undersigned, on or before Twelve o'clock noon, on Monday, the 7th day of February, 1898.

PEREGRINE THOMAS,
Clerk to the Council.

Town Hall, Leigh, Lancs.,
Jan. 26, 1898.

LIVERPOOL UNITED GASLIGHT COMPANY.

TAR.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the TAR produced at their several Works for a period of One Year from July 1, 1898.

The quantities of Tar produced per annum are estimated to be as follows; but the same cannot be guaranteed, and may be more or less:—

At the Athol Street Works, about			720,000	gallons.
,,	Eccles Street	,, ,,	400,000	,,
,,	Caryl Street	,, ,,	480,000	,,
,,	Wavertree	,, ,,	510,000	,,
,,	Linacre	,, ,,	2,800,000	,,
,,	Garston	,, ,,	230,000	,,

The Tenders may be for the whole, or for one or more of the Works separately.

Forms of Tender and full Particulars may be obtained on application to the undersigned.

Tenders, sealed and endorsed "Tender for Tar," are to be delivered here not later than the 19th of February, 1898.

The Directors reserve to themselves the right to accept any tender in part or in whole, and do not bind themselves to accept the highest or any tender.

By order,
WILLIAM KING,
Engineer.

Gas Office, Duke Street, Liverpool,
Feb. 1, 1898.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the "Albion Tavern," Aldersgate Street, London, E.C., on Friday, the 18th day of February, 1898, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend for the same period, to elect two Directors and one Auditor in the place of those retiring by rotation, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 4th day of February until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Feb. 1, 1898.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc M.Inst.C.E., F.C.S.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GREAT YARMOUTH WATER-WORKS COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, Feb. 14, 1898, at Two o'clock, in Lots,
£2500 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK
OF THE
GREAT YARMOUTH WATER-WORKS COMPANY, offering a thoroughly high-class Investment.
Particulars of the AUCTIONEER, as above.

By order of the Directors of the
CRAYS GAS COMPANY.

£3500 ORDINARY FIVE PER CENT. STOCK.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Monday, Feb. 14, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, as above.

By order of the Directors of the
WHITCHURCH AND DISTRICT (HANTS) GAS COMPANY, LIMITED.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Monday, Feb. 14, at Two o'clock, in Lots,
150 £10 FULLY-PAID ORDINARY SHARES in the above Undertaking.
Particulars may be obtained of the AUCTIONEER, as above.

By order of Executors and other Owners.

GAS AND WATER STOCKS AND SHARES
IN THE
MAIDENHEAD GAS COMPANY, GREAT YARMOUTH WATER COMPANY, GORING AND STREATLEY GAS AND WATER COMPANY, HENFIELD GAS COMPANY, LIMITED, AND PORTSEA ISLAND GAS COMPANY.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Monday, Feb. 14, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, as above.

Price, Bound in Cloth, 5s. 6d., Post Free.
— FIFTEENTH YEAR —
THE
COMPLETE REPORTS
OF
PROCEEDINGS
OF THE
DISTRICT ASSOCIATIONS
OF
GAS ENGINEERS & MANAGERS
OF THE UNITED KINGDOM
FOR 1897.

The Fourteen previous Volumes are still on Sale.

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SANDELL'S
Gas Companies' Account Books.

The Gas Companies' Expenditure Journal.
With Printed Headings and Analyzing Guide, for keeping the Expenditure of Gas Companies upon the easiest and most correct method, and in accordance with the provisions of the Gas-Works Clauses Act of 1871. Size, 16⅜ in. by 17½ in.

Price: Half-bound, cloth sides, two quires, 36s.; three quires, 45s.

This Book and its predecessor (on the same principle) have been in use since 1867.

The Gas Companies' Rental Book.
A companion Book to above with Printed Headings and Illustration, for keeping the Consumers' Accounts.

Size and Price as above.

The Analyzed Wages Book.
Compiled for use in conjunction with the above Expenditure Journal, with Printed Headings. Size, 15 in. by 10½ in.

Price: Half-bound, cloth sides, two quires, 15s.

Published by
SPOTTISWOODE & Co., 54, Gracechurch Street, E.C., and may also be had from CHARLES SANDELL, 3, Jeffrey's Square, St. Mary Axe, E.C.

Ready this Day—450 Pages, Crown 8vo., with numerous Illustrations, 10s. 6d. Leather.

THE
GAS ENGINEER'S POCKET BOOK,

Comprising Tables, Notes, and Memoranda relating to the Manufacture, Distribution, and Use of Coal Gas, and the Construction of Gas-Works.

By HENRY O'CONNOR, Assoc.M.Inst.C.E.

London: CROSBY LOCKWOOD & SON,
7, STATIONERS' HALL COURT, E.C.

GAS PURIFICATION BY
HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.

MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

ALEXANDER CAMERON,
GAS AND CANNEL COAL MERCHANT,
48, WEST REGENT STREET,
GLASGOW.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THE
"ETNA" FIRE & HEAT RESISTING
CEMENT,
For RETORT PURPOSES, is INVALUABLE.
Sole Manufacturers:
FRED VERITY & SON,
CALL LANE, LEEDS.
Scores of Testimonials received. Write for Particulars.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

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STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

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Prices and Analysis of all the Scotch Cannels on Application.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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FIRE-BRICKS, FIRE-CLAY, & FURNACE CEMENT.

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FURNACE FIRE-BRICK CO., Ltd.

(Late JAMES WHITE & CO.)

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MANUFACTURERS OF

HIGH-CLASS FIRE-BRICKS, acknowledged to be the best obtainable for

GAS, IRON, AND CHEMICAL FURNACES.

For Analysis and Prices, address—

JAMES WHITE & CO.,

WIDNES, LANCASHIRE.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England, and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

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CANDLE SAFETY LAMPS

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

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Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

INCANDESCENT GAS LIGHTING

Has now gained a complete and final **Victory** over its last and greatest Enemy

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Incandescent Burner Fittings

Of which full Particulars may be had from

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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke. Maintains a High Standard in Residuals.

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THOMAS TURTON AND SONS, LIMITED,

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STEEL OF ALL DESCRIPTIONS.

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BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

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COAL OWNERS, NEWCASTLE-ON-TYNE:

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

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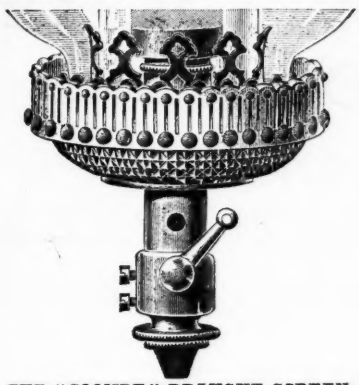

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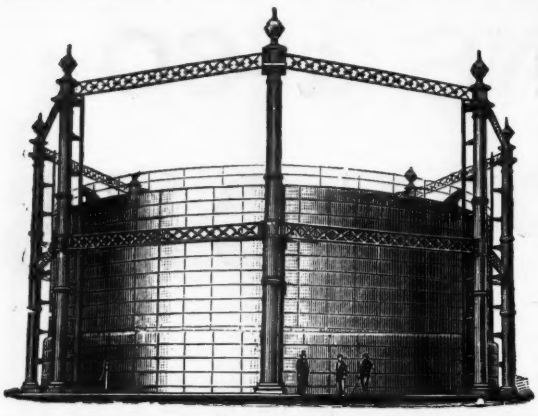

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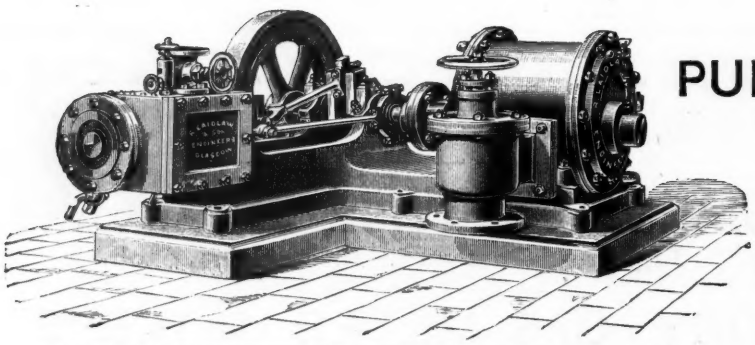

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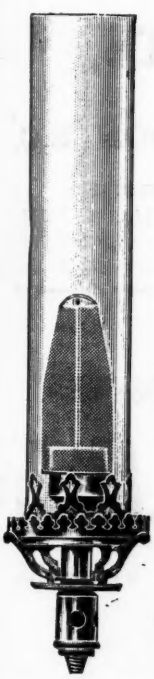

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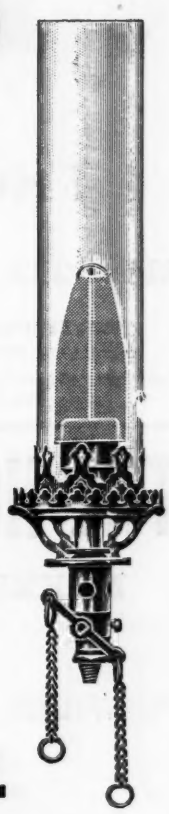

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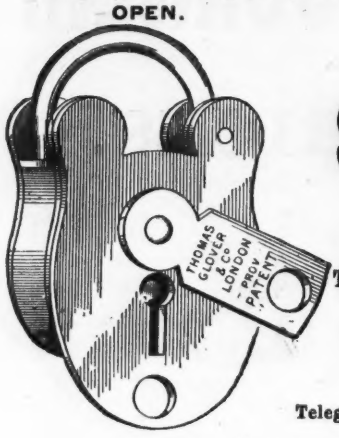

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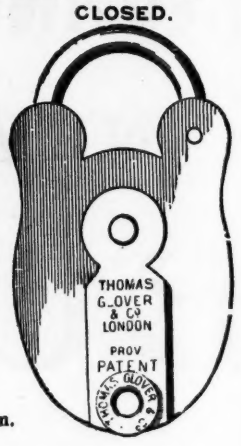

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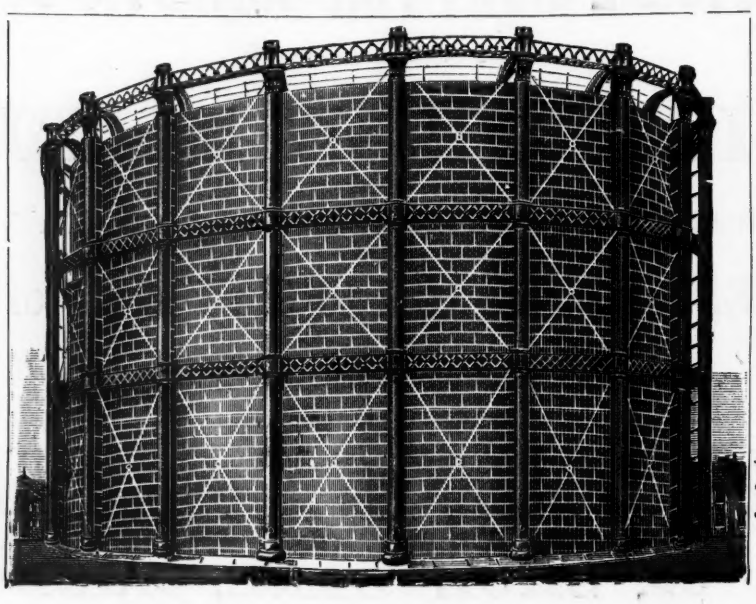

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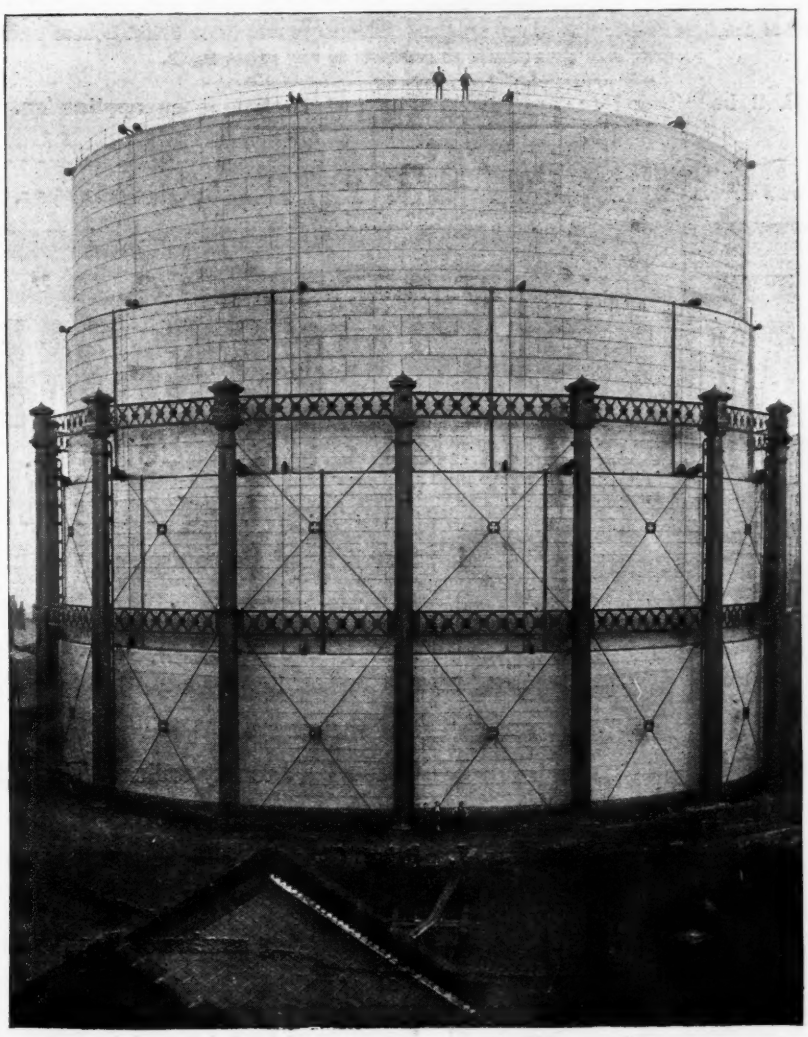

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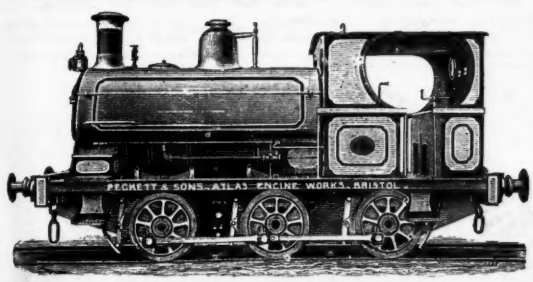

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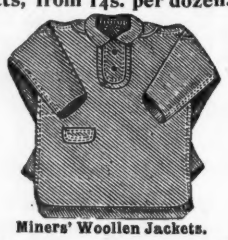

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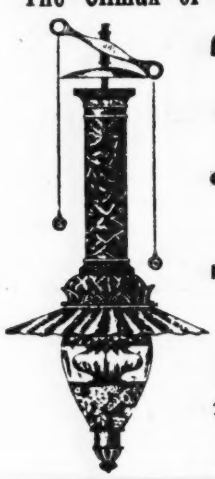

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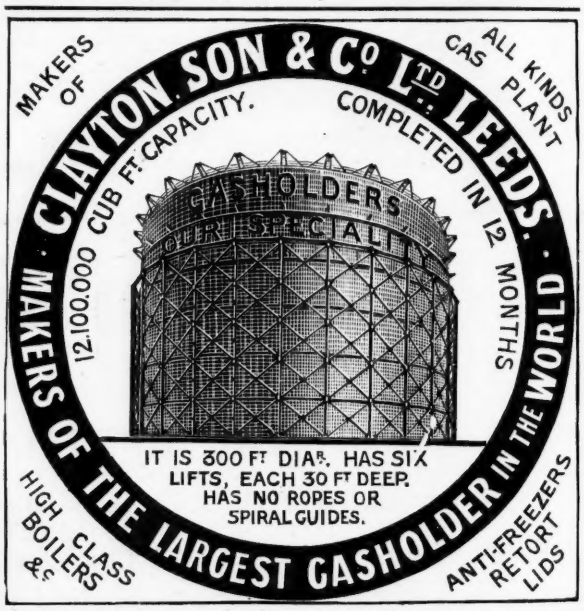
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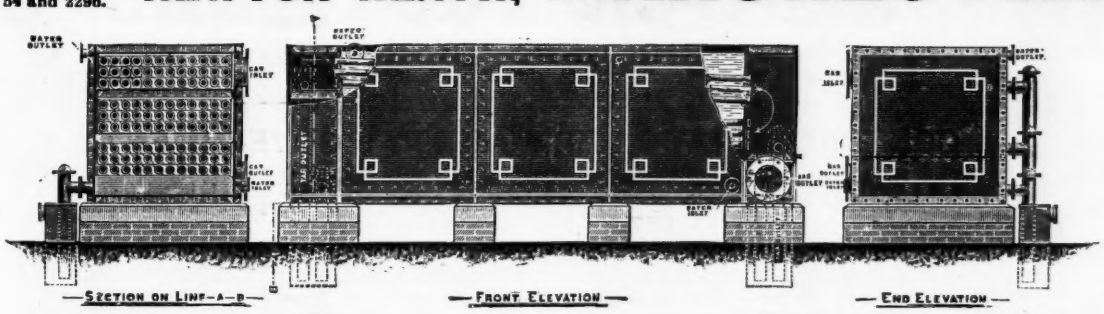

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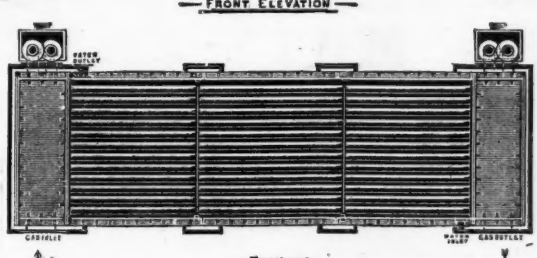

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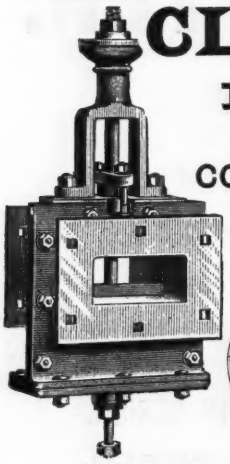

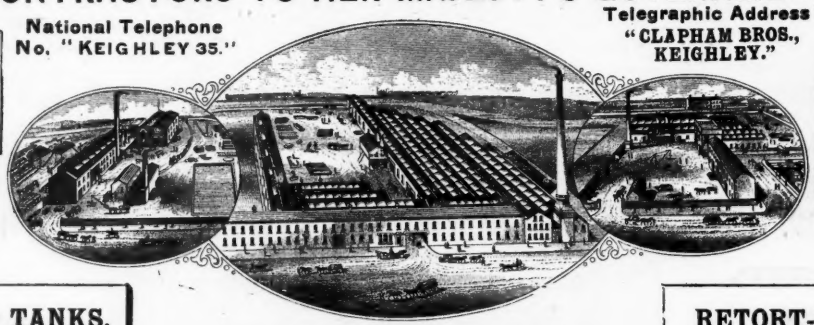

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